Rapids on the Cocheco River

Watershed Restoration and Implementation Plan for the Cocheco River

June 2006

Watershed Restoration and Implementation Plan for the Cocheco River

Prepared for

Cocheco River Watershed Coalition
Dover, NH

Prepared by

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June 2006

This report was funded in part by a grant from the New Hampshire Department of Environmental Services as authorized by the US Environmental Protection Agency pursuant to Section 319 of the Clean Water Act.

Cocheco River Watershed
Restoration and Implementation Plan

Acknowledgments

The *Cocheco River Watershed Restoration and Implementation Plan* was completed through the efforts of many committed individuals, watershed communities, and professionals. The executive committee of the Cocheco River Watershed Coalition (CRWC) identified the need for this process and conceived the idea of a restoration plan. They provided valuable guidance and oversight throughout the planning process. Volunteers donated thousands of hours of their time to amass the data used to form the technical basis for the plan. Many concerned citizens and professionals responded to a survey prepared for the restoration planning process to provide a better understanding of the needs and desires of the communities in the watershed. The restoration planning committee devoted many hours to developing the goals, objectives and actions included in the plan.

The New Hampshire Department of Environmental Services (DES) provided the funds and professional support for water quality sampling and for the completion of the restoration and implementation plan. In particular, Ted Walsh who heads the Volunteer River Assessment Program (VRAP) provided excellent assistance throughout sampling episodes and helped to formulate new sampling points and future sampling efforts. Natalie Landry from the Watershed Management Bureau of DES provided thorough and meaningful editing comments, detailed assessment unit information, and stormwater loading calculations. These data were fundamental to the completion of this project.

University of New Hampshire Cooperative Extension provided office space, its facilities and staff support staff for the CRWC. Additionally their supplemental funding supported printing and distribution of this document. The United States Environmental Protection Agency supported the completion of the plan through funding dedicated to successful implementation of Section 319 of the Clean Water Act. Finally, this plan could not have been completed without the hard work, dedication, and substantial contributions of Lorie Chase, Project Coordinator for the Cocheco River Watershed Coalition.

This plan is dedicated to the concerned citizen volunteers in the watershed whose interest in the River underlined the need for sound watershed planning and management and propelled the planning process forward, and who will use this plan and associated reports to make informed decisions in their communities.

Executive Summary

The purpose of the *Watershed Restoration and Implementation Plan for the Cocheco River* is to summarize current watershed conditions, explain the restoration planning process, and describe the goals, objectives and actions developed by members of the watershed community.

Canoeing the Cocheco

Prior to completion of this plan, the *Cocheco River Watershed Environmental Quality Report* was prepared (Fargo & Truslow, 2005). This set the scene for developing the restoration plan and helped guide another companion document, the *Cocheco River Watershed Monitoring Plan - 2006 and 2007* (Truslow & Fargo, 2006). The Cocheco River Watershed Coalition has monitored the water quality of the river in association with the New Hampshire Department of Environmental Services since 1999. These organizations developed the concept for completing this group of guidance documents and will continue to work together to implement the *Watershed Restoration and Implementation Plan for the Cocheco River*.

The Cocheco River Watershed includes twelve major tributary streams including the Mad River, Dames Brook, Ela River, Rattlesnake River, Hurd Brook, Willow (Wordley) Brook, Axe Handle Brook, Blackwater Brook, Reyners Brook, Indian Brook, Rollins Brook and the Isinglass River. In addition, seventeen lakes and ponds are within the watershed boundary (Hull, 1997). Wetlands, and smaller named and unnamed headwater brooks and streams also feed into the larger stream and river system that makes up the Cocheco River Watershed. The location of the watershed in southeastern New Hampshire is shown in Figure 1. The Cocheco River Watershed is part of the Great Bay Estuary, a nationally recognized ecosystem that was accepted into the National Estuary Program in 1996. The river is one of the seven major rivers that flow into the estuary.

The area covered by the *Watershed Restoration and Implementation Plan* is bounded to the north by Birch Ridge in New Durham and to the east by Nute Ridge and several smaller drumlins that separate it from the Salmon Falls River watershed. To the south

Prospect Mountain, the Blue Hills Range and the edge of Mallego Plains bound the watershed.

There are five subwatersheds within the study area - the Upper Cocheco, Axe Handle Brook, Middle Cocheco, Lower Isinglass, and Lower Cocheco subwatersheds. Many proposed actions and concerns within the plan are specific to these subwatersheds.

The entire watershed is experiencing rapid growth and development. Between 1990 and 2000, there was a 5.9 % increase in impervious cover. In the Lower Cocheco Watershed, one of the more developed subwatersheds, the 2000 impervious cover was estimated at 12%. The population of the watershed is expected to increase 21% between 2000 and 2020. The rural communities in the Upper and Middle Cocheco watersheds, which lack extensive infrastructure, are especially vulnerable to rapid sprawl-like growth. The mostly volunteer municipal boards – planning, zoning and conservation – need reliable information about the watershed so that good decisions can be made about land use. It is hoped that towns will adopt this plan as part of their master plan and see that their decisions may affect other areas up and down the watershed.

As more focus turns to quality of life, economic vitality, and rejuvenation of towns and cities, there is a growing understanding of the importance of the river to the overall health of the communities through which it flows. The plan is timely for all of these reasons and provides a foundation to coordinate efforts between citizens, agencies and municipalities.

After a thorough evaluation of current conditions and a lengthy planning process, four goals were established for restoration:

- *Public Perception and Education Goal - Change the negative public perception of and behavior toward the Cocheco River so that the assets and benefits of the Cocheco River can be realized.*
- *Water Quality Restoration Goal - Improve the water quality of the Cocheco River to meet New Hampshire Class B water quality standards by 2015.*
- *Habitat Improvement Goal - Understand and improve the instream and riparian habitat of the River to assure the ecological well being of the Cocheco River.*
- *Development and Stormwater Impact Goal - Minimize the impact of current and future development and infrastructure and associated stormwater impacts on the Cocheco River watershed.*

Multiple objectives were developed for each goal, and in total, over 80 actions were developed to achieve these goals.

A Watershed Coordinator, governed by a strengthened Cocheco River Watershed Coalition Board of Directors, will carry out plan implementation. A Restoration Technical Advisory Committee will be formed of natural resource professionals, municipal officials and volunteers to guide and evaluate restoration implementation. CRWC will continue to build on the strong relationships it has built with citizens, organizations and municipalities within the watershed in order to effectively implement restoration plans and actions.

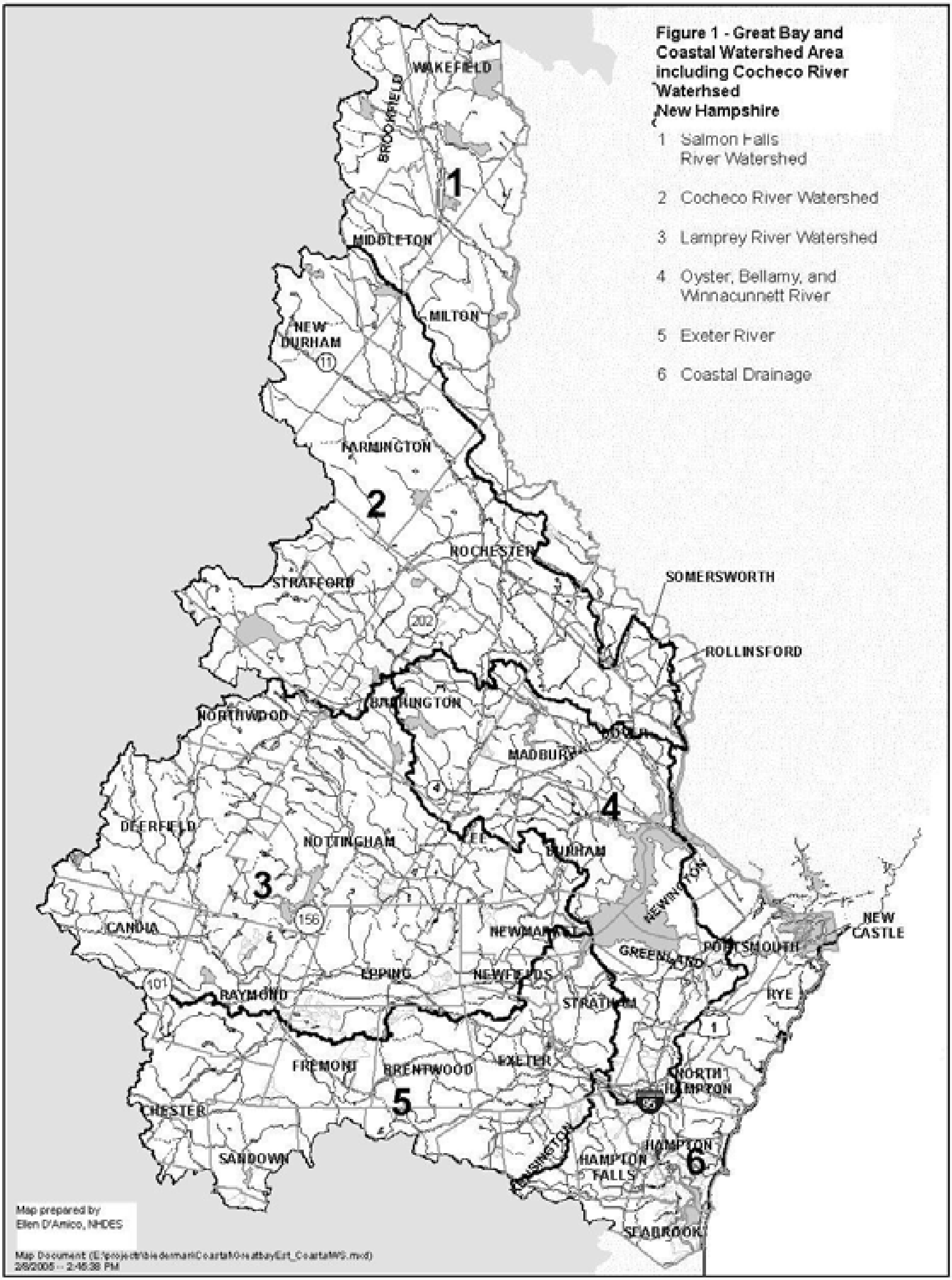

Figure 1 - Great Bay and Coastal Watershed Area including Cocheco River Waterhsed New Hampshire

Cocheco River Watershed
Restoration and Implementation Plan

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Cocheco River Watershed
Restoration and Implementation Plan

Section 1 – Cocheco River Restoration - A Project Overview

Since 1998, the Cocheco River Watershed Coalition (CWRC) has been working with the New Hampshire Department of Environmental Services (DES) to monitor the water quality of the river. In 1999, the Cocheco River Watch was established with three monitoring teams under the direction of the DES Volunteer River Assessment Program (VRAP). In an effort to better understand and document the broad range of technical issues relating to the health of the watershed, the CWRC applied for a grant from the DES funded through the Section 319 Clean Water Act grants program. In 2003 the DES awarded the CRWC funds to support a project titled, *Environmental Quality Characterization and Recommended Monitoring and Restoration for the Cocheco River*. According to DES:

> This project aims to establish a baseline of existing conditions, identify sources of contaminants and determine impacts on the Cocheco River ecosystem as a whole. This will be accomplished through the compilation and analysis of existing information, creation of watershed and site descriptions and land use cover maps, to determine recommendations for future monitoring programs and restoration activities within the Cocheco River Watershed.

D.B. Truslow Associates was contracted by the Cocheco River Watershed Coalition to write three documents:

1. An Environmental Quality Report that describes the pollution issues, pollution sources and the resulting human and biological impacts, if known. The report identifies gaps in information for both spatial coverage and measured parameters. This document was completed in February 2005.
2. A Monitoring Plan that addresses issues and pollutants that have been identified as important in previous studies. This document provides guidance for monitoring long-term trends and the success of the restoration efforts described in the Restoration and Implementation Plan.
3. A Restoration and Implementation Plan that describes actions to address the environmental quality problems, the steps needed to complete the restorative action, measures for success, community interest, an estimated budget for each restoration action, and an organizational structure for implementation.

All three documents guide the watershed management of the Cocheco River. This plan, the *Cocheco River Watershed Restoration and Implementation Plan*, was built using the environmental quality report information and surveys completed by local stakeholders. It is the guide for the community to use to restore the degraded parts of the river and protect the habitat and recreational uses cherished by all who fish, swim and paddle on the river.

Section 2- Where and What is Cocheco River?

The Watershed

A watershed is the total area of land that is drained by the network of streams and their related drainage features. The Cocheco River watershed encompasses approximately 185 square miles. This watershed makes up one portion of the larger Piscataqua and Salmon Falls rivers watershed in southeastern New Hampshire and southwestern Maine. (Fargo and Truslow, 2005). The Cocheco River is one of seven major rivers that flow into the Great Bay Estuary, a nationally recognized estuary that was accepted into the National Estuary Program in 1996.

The physical, chemical and biological makeup of a river system is a direct result of the landscape around it. Slope, soil and rock type, vegetation, climate, and manmade changes to the landscape all effect stream geometry, water quality, and the community of plants and animals that occupy it. In other words, what happens on land has a direct bearing and impact on neighboring streams and rivers.

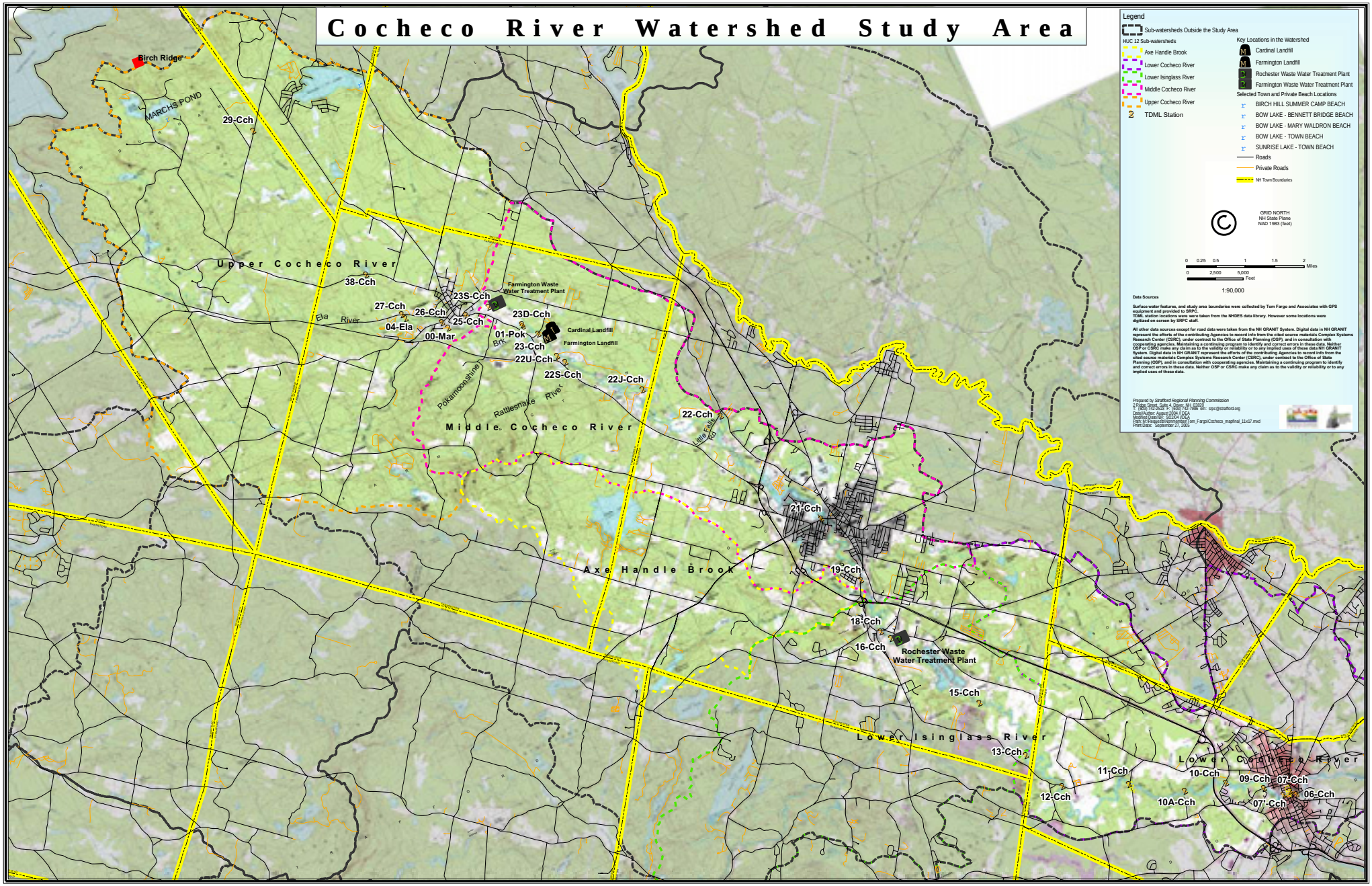
The Cocheco River Watershed includes twelve major tributary streams including the Mad River, Dames Brook, Ela River, Rattlesnake River, Hurd Brook, Willow (Wordley) Brook, Axe Handle Brook, Blackwater Brook, Reyners Brook, Indian Brook, Rollins Brook and the Isinglass River. In addition, seventeen lakes and ponds are within the watershed boundary (Hull, 1997). Wetlands, and smaller named and unnamed headwater brooks and streams also feed into the larger stream and river system that makes up the Cocheco River Watershed. The location of the watershed in southeastern New Hampshire is shown on Figure 1.

The activities of the Cocheco River Watershed Coalition (CRWC) have concentrated primarily on assessing the main stem of the river from its upper reaches in Farmington, through Rochester, to just above the tidal waters in downtown Dover. The project area encompassed by this restoration plan covers this area and the smaller streams and watershed areas that feed this main stem.

The Isinglass River watershed is not included in the project area. In 2002, the Isinglass River became a designated river according to the requirements of the New Hampshire Rivers Management and Protection Program. A Local Advisory Committee was formed to monitor and guide the activities along the Isinglass and to cooperate with other watershed organizations in the area. The Cocheco River restoration area is shown as the CRWC Study Area in Figure 2. This area has been calculated to encompass 101.7 square miles.

The study area is bounded to the north by Birch Ridge in New Durham, to the east by Nute Ridge and several smaller drumlins that separate it from the Salmon Falls River watershed. To the south Prospect Mountain, the Blue Hills Range and the edge of Mallego Plains bound the watershed.

The geology of today's Cocheco landscape changes dramatically throughout the watershed. In the upper watershed, glacial till and bedrock make up the majority of the near subsurface materials. These landscapes were carved from the rock by glaciers and


Cocheco River Watershed Study Area
Birch Ridge
MARCHS POND
29-Cch
Upper Cocheco River
38-Cch
23S-Cch
Farmington Waste Water Treatment Plant
27-Cch
26-Cch
25-Cch
23D-Cch
04-Ela
00-Mar
01-Pok
Cardinal Landfill
Farmington Landfill
23-Cch
22U-Cch
22S-Cch
22J-Cch
Ela River
Pokamoonshine Brk
Rattlesnake River
Middle Cocheco River
22-Cch
Little Pickering Rd
21-Cch
Axe Handle Brook
19-Cch
18-Cch
16-Cch
Rochester Waste Water Treatment Plant
15-Cch
Lower Isinglass River
13-Cch
11-Cch
12-Cch
10-Cch
10A-Cch
09-Cch
07-Cch
07'-Cch
06-Cch
Lower Cocheco River
Legend
Sub-watersheds Outside the Study Area
HUC 12 Sub-watersheds
Axe Handle Brook
Lower Cocheco River
Lower Isinglass River
Middle Cocheco River
Upper Cocheco River
TDML Station
Key Locations in the Watershed
Cardinal Landfill
Farmington Landfill
Rochester Waste Water Treatment Plant
Farmington Waste Water Treatment Plant
Selected Town and Private Beach Locations
BIRCH HILL SUMMER CAMP BEACH
BOW LAKE - BENNETT BRIDGE BEACH
BOW LAKE - MARY WALDRON BEACH
BOW LAKE - TOWN BEACH
SUNRISE LAKE - TOWN BEACH
Roads
Private Roads
NH Town Boundaries
GRID NORTH
NH State Plane
NAD 1983 (feet)
0 0.25 0.5 1 1.5 2 Miles
0 2,500 5,000 Feet
1:90,000
Data Sources
Surface water features, and study area boundaries were collected by Tom Fargo and Associates with GPS equipment and provided to SRPC.
TDML station locations were were taken from the NHDES data library. However some locations were digitized on screen by SRPC staff.
All other data sources except for road data were taken from the NH GRANIT System. Digital data in NH GRANIT represent the efforts of the contributing Agencies to record info from the cited source materials Complex Systems Research Center (CSRC), under contract to the Office of State Planning (OSP), and in consultation with cooperating agencies. Maintaining a continuing program to identify and correct errors in these data. Neither OSP or CSRC make any claim as to the validity or reliability or to any implied uses of these data NH GRANIT System. Digital data in NH GRANIT represent the efforts of the contributing Agencies to record info from the cited source materials Complex Systems Research Center (CSRC), under contract to the Office of State Planning (OSP), and in consultation with cooperating agencies. Maintaining a continuing program to identify and correct errors in these data. Neither OSP or CSRC make any claim as to the validity or reliability or to any implied uses of these data.
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Print Date: September 27, 2005

streams leaving behind areas with thin soil cover and elongated hills called drumlins formed by the advance of the glacier, and made up largely of glacial till.

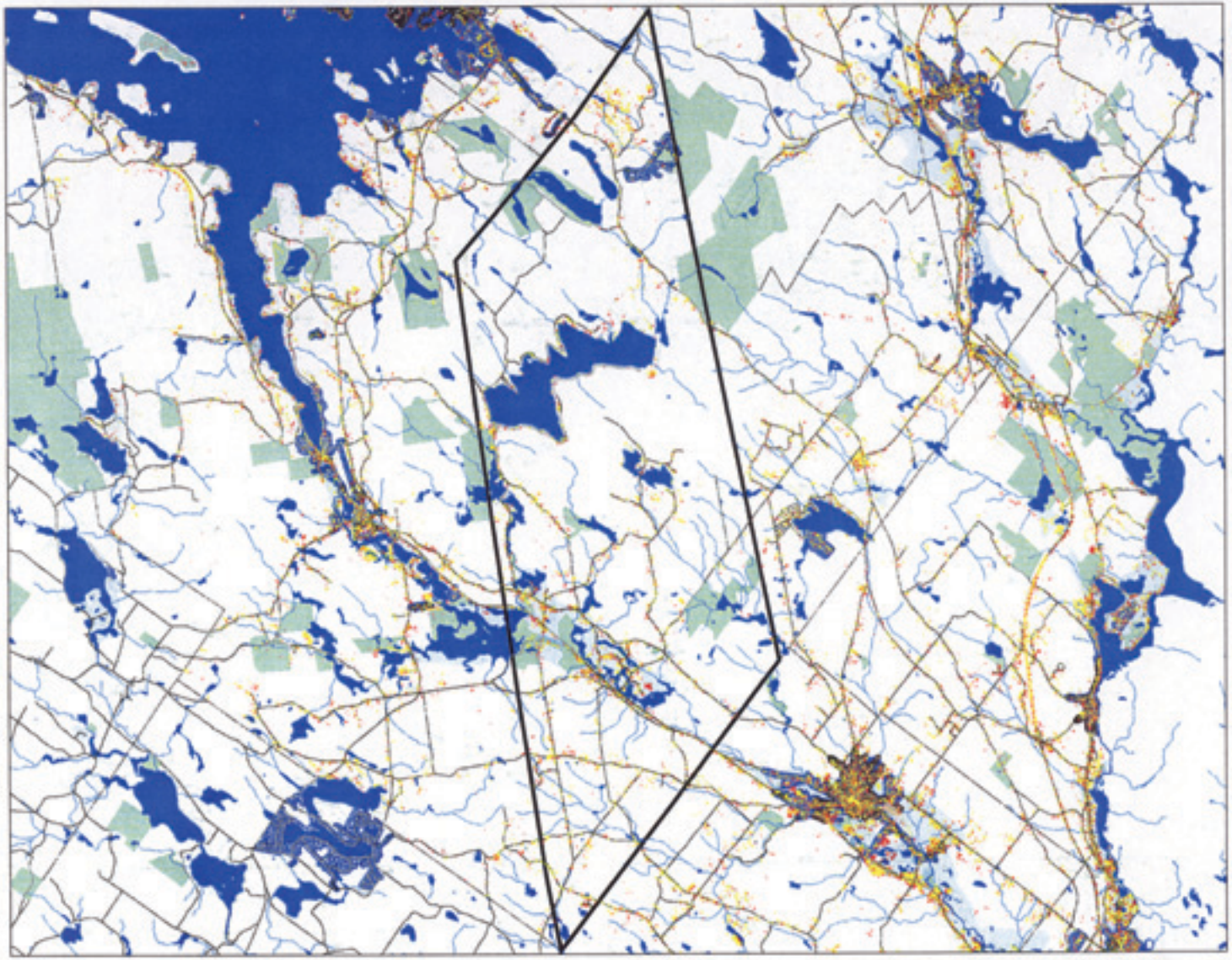
Just downstream of downtown Farmington, the character of Cocheco geology changes dramatically. Thick sand and gravel deposits left by melting glaciers occupy the river bottom and valley. Sand and gravel companies have been extracting these materials for construction for decades. Broader floodplains, wetlands and backwaters occupy the lower watershed area where these same meltwater deposits of sands, gravels, silt and marine-deposited clays cover bedrock and glacial till. Many of the sand and gravel deposits near the main stem of the Cocheco are considered highly productive aquifers, which could yield appreciable groundwater for public water supplies. Wetlands in the Middle and Lower Cocheco watersheds are important to recharge of aquifers and sustain surrounding streams and the river.

Facts and Figures

Some facts and figures on the Cocheco River Watershed Study area are included in Table 1. This information illustrates the importance of the river to the area and the impacts that the human population has and will continue to have on the watershed. For a glossary of hydrologic terms used in the report, please refer to the web address http://www.srh.noaa.gov/fwr/resources/glossary. A glossary of acronyms and abbreviations is included at the end of this report.

Figures 3 through 7 provided by the New Hampshire Estuaries Project (NHEP, 2004), illustrate some of the physical characteristics of the major towns in the watershed. These characteristics include impervious surfaces as of 1990 and in 2000 shown in yellow and red, respectively. Areas served by public water supply are shown in medium gray, and high transmissivity aquifers are shown in light blue. Lands protected for conservation are shown in green. These figures especially illustrate the changes in the rural areas that surround Dover, Rochester and Farmington, and in the upper watershed. The towns of New Durham and Middleton make up an appreciable percent of the total area of the Upper Cocheco Watershed and still have relatively little impervious cover. This low percentage is important to maintain in the headwater streams area where recharge and good initial water quality are crucial. More evaluation of the Somersworth area (approximately 20% in the Lower Cocheco Subwatershed) and Milton (approximately 10% in the Upper “Cocheco Watershed) area will be made as restoration proceeds.

Impervious Surfaces and Water Resources in New Durham, New Hampshire



Impervious Surfaces (IS)

- IS Present in 1990
- IS Added Between 1990 and 2000

Water Resources

- Rivers and Streams
- Lakes, Ponds, and Reservoirs
- Town Sewer Service Area
- Town Water Service Area
- Town Sewer and Water Service Area

Stratified Drift Aquifer Transmissivity

- 1000 – 4000 (ft²/d*100ft)
- >4000 (ft²/d*100ft)

Boundaries and Features

- Selected Town Boundary
- Town Boundary
- Roads (NHDOT)
- Conservation/Public Land

NOTES:
1. Conservation and Public Lands developed and maintained by the Society for the Protection of NH Forests and NH GRANIT at Complex Systems Research Center, UNH.
2. Stratified drift aquifer data developed by the US Geological Survey in cooperation with the NHDES Water Division (1:24,000).
3. Water/Sewer service areas (if shown) developed by NHDES-WSEB (general service area only - not represent actual pipelines).
4. Hydrography, transportation, and political boundaries from USGS 1:24,000-scale digital line graph data provided by NH GRANIT at Complex Systems Research Center, UNH.
5. Impervious surface coverage provided by NH GRANIT at Complex Systems Research Center. Colored pixels represent areas estimated to be >50% covered by impervious surfaces. Each pixel represents a 30 m x 30 m area.

The coverages represented are under constant revision. NHDES is not responsible for the use or interpretation of this information. Not intended for legal purposes.

Map prepared August 2004 by NHDES for the NH Estuaries Project.

N

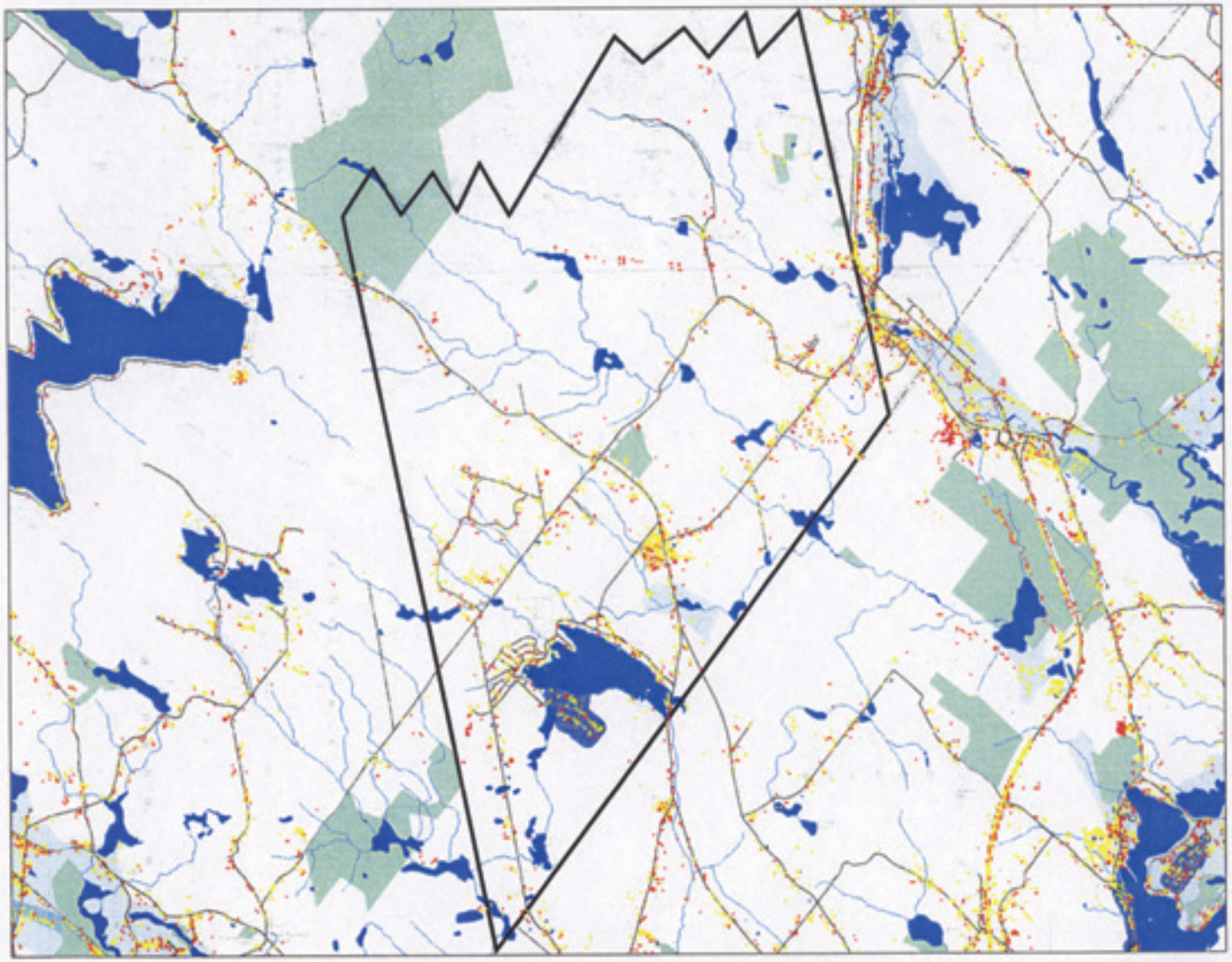
0 2 4 Miles

Scale 1:80,000

Summary for New Durham, NH	1990	2000	NHEP Goal
Impervious Surfaces (acres)	458	628	
Land Area (acres)	26,347	26,347	
Percent Impervious Surfaces (%)	1.7%	2.4%	<10%
Population (people)	1,974	2,220	
Imperviousness per capita (acres/person)	0.23	0.28	<0.10

NewHampshire EstuariesProject

Impervious Surfaces and Water Resources in Middleton, New Hampshire



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Map prepared August 2004 by NHDES for the NH Estuaries Project.

N

0 1 2 Miles

Scale 1:40,000

Summary for Middleton, NH	1990	2000	NHEP Goal
Impervious Surfaces (acres)	204	284	
Land Area (acres)	11,560	11,560	
Percent Impervious Surfaces (%)	1.8%	2.5%	<10%
Population (people)	1,183	1,440	
Imperviousness per capita (acres/person)	0.17	0.20	<0.10

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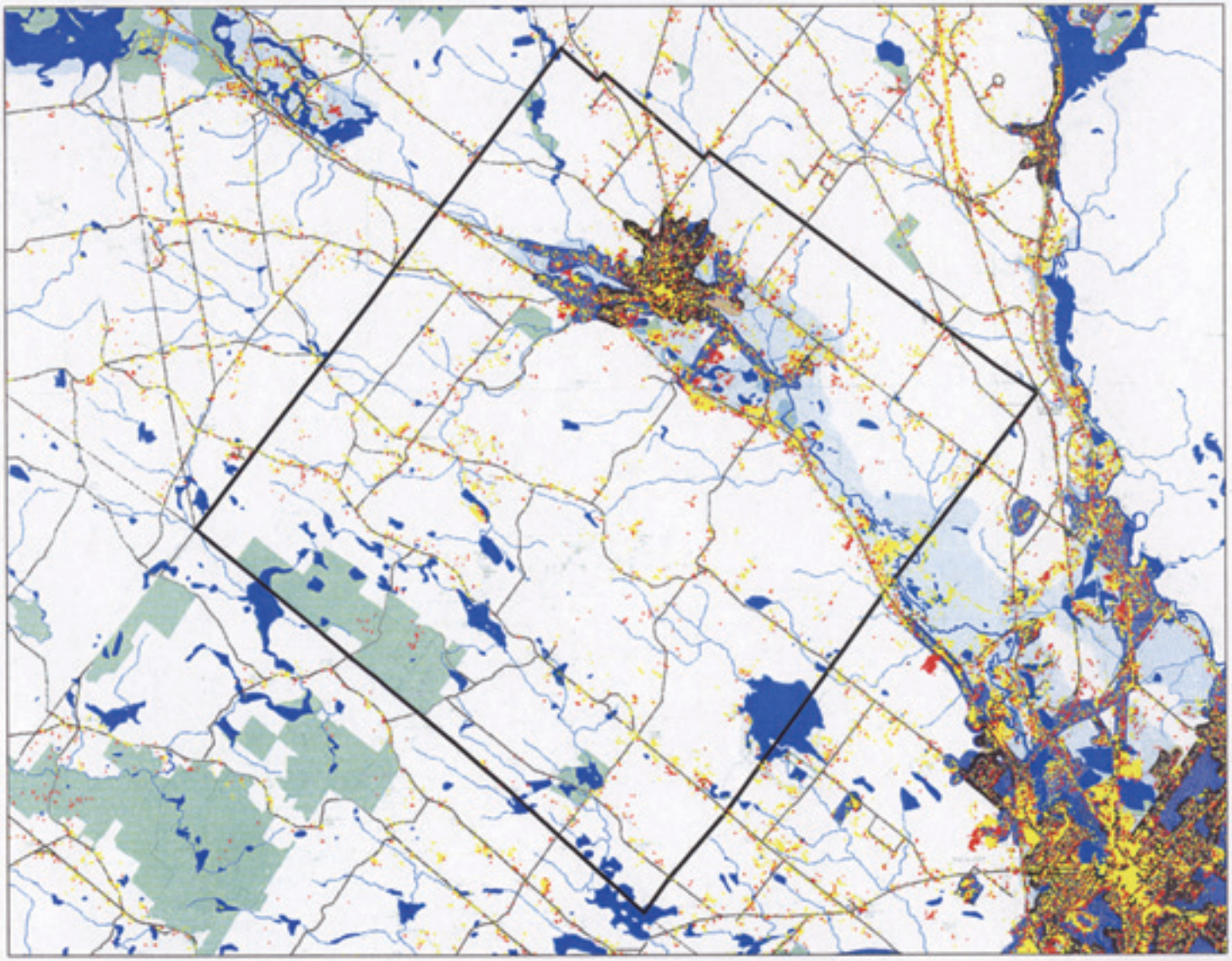
Impervious Surfaces and Water Resources in Farmington, New Hampshire



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Map prepared August 2004 by NHDES for the NH Estuaries Project.

N

0 1 2 Miles

Scale 1:50,000

Summary for Farmington, NH	1990	2000	NHEP Goal
Impervious Surfaces (acres)	687	966	
Land Area (acres)	23,221	23,221	
Percent Impervious Surfaces (%)	3.0%	4.2%	<10%
Population (people)	5,739	5,774	
Imperviousness per capita (acres/person)	0.12	0.17	<0.10

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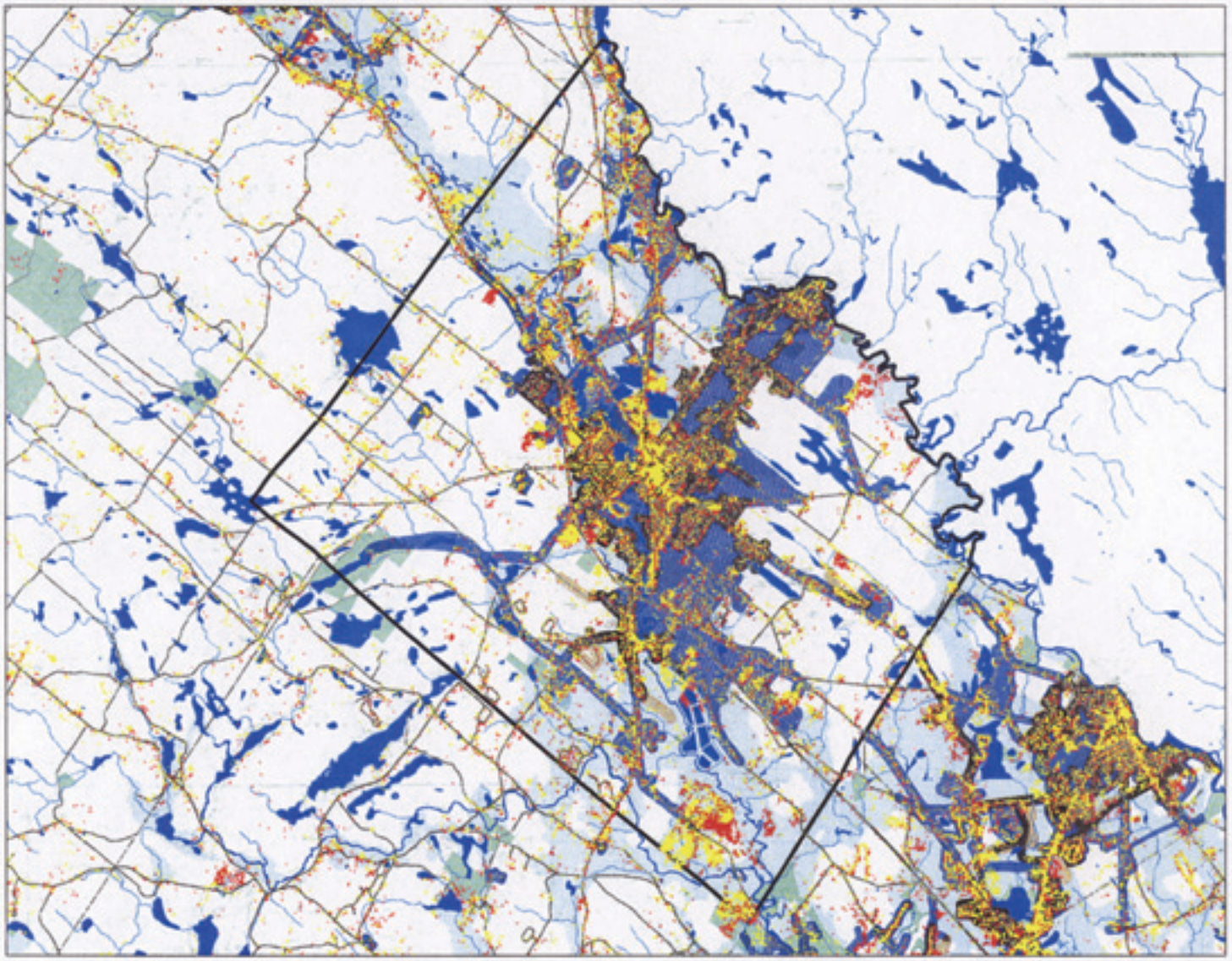
Impervious Surfaces and Water Resources in Rochester, New Hampshire



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Map prepared August 2004 by NHDES for the NH Estuaries Project.

N

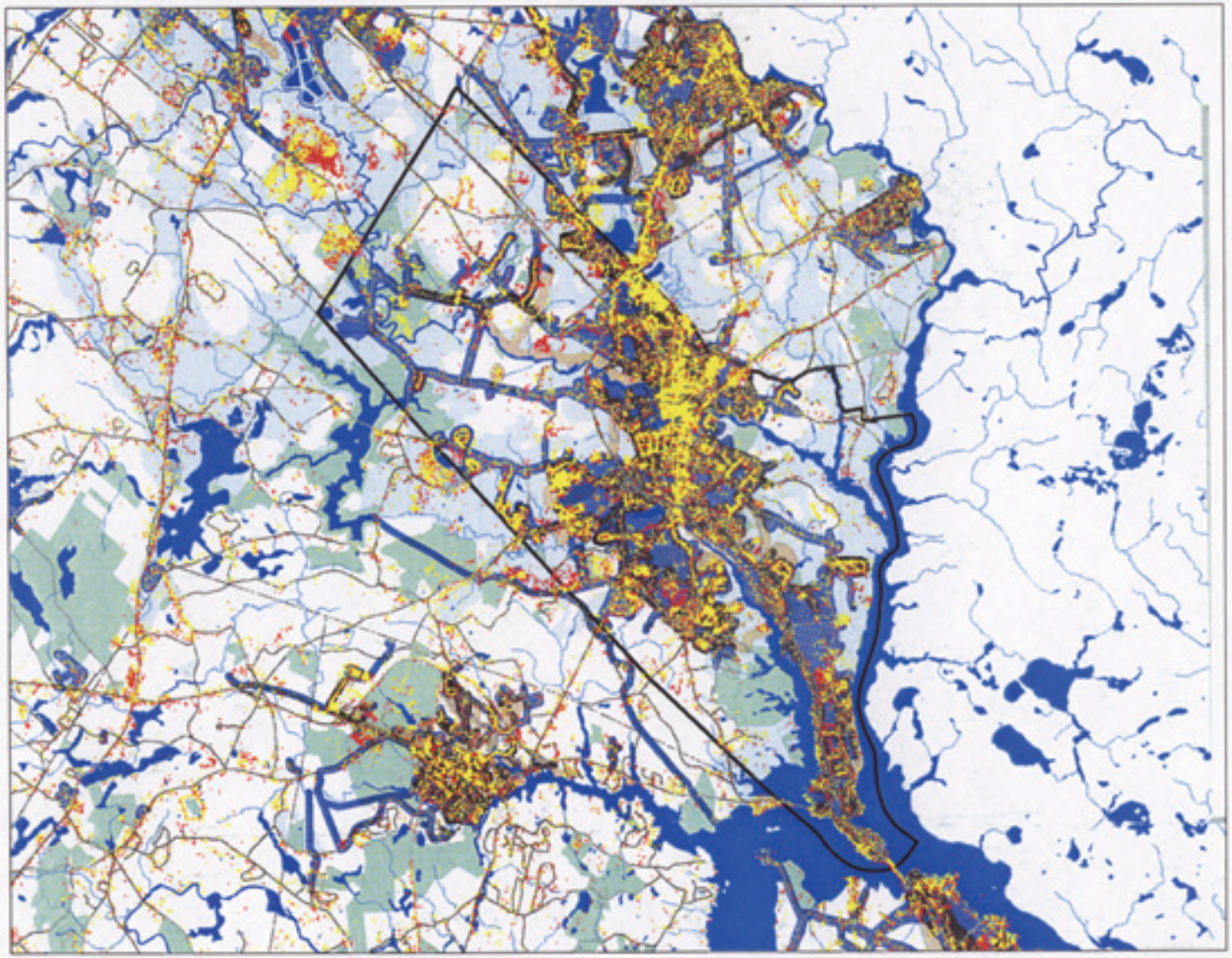
0 2 4 Miles

Scale 1:60,000

Summary for Rochester, NH	1990	2000	NHEP Goal
Impervious Surfaces (acres)	2,395	3,304	
Land Area (acres)	28,331	28,331	
Percent Impervious Surfaces (%)	8.5%	11.7%	<10%
Population (people)	26,630	28,461	
Imperviousness per capita (acres/person)	0.09	0.12	<0.10

NewHampshire Estuaries Project

Impervious Surfaces and Water Resources in Dover, New Hampshire



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N

0 2 4 Miles

Scale 1:60,000

Summary for Dover, NH	1990	2000	NHEP Goal
Impervious Surfaces (acres)	1,873	2,626	
Land Area (acres)	17,094	17,094	
Percent Impervious Surfaces (%)	11.0%	15.4%	<10%
Population (people)	25,042	26,884	
Imperviousness per capita (acres/person)	0.07	0.10	<0.10

NewHampshire EstuariesProject

Table 1
Facts and Figures - Cocheco River Watershed Study Area
Source: Fargo & Truslow, 2005

Facts	Figures
Area of Cocheco River Watershed Study Area	101.7 square miles
Number of designated Subwatersheds	5
Elevation Change Along River (headwaters to Cocheco Dam in Dover)	730 feet
Median Daily Discharge (at Rochester)	71 cubic feet per second
Maximum Recorded Discharge (at Rochester)	2980 cubic feet per second
Minimum Recorded Discharge (at Rochester)	2 cubic feet per second
Total Discharge to Estuary	9.01 billion cubic feet per year
Human Population of Watershed – 2000	68,689
Projected Human Population – 2020	83,370
Projected Population Change 2000 to 2020	14,681 (21.4%)
Impervious Surface Area, Lower Cocheco- 2000	12%
Acres of Conservation Land in Study Area - 2003	5300 acres
Watershed wide Change in Impervious Surface Area – 1990 to 2000	5.9 %

Recent History of the Cocheco River

The Cocheco River gets its name from the falls in downtown Dover. Cocheco, meaning rapidly foaming water, was the name given to the falls by the Native Americans, and the English settlers adopted that name for the entire river (Thompson, 1892). The following history of the Cocheco is summarized from a presentation given by Rueben Hull, in November 1997 (Hull, 1997).

Prior to the arrival of English settlers in the early 1600s, the area was used by the Abenakis for fishing, hunting and agriculture. Later, many of the native inhabitants were decimated by “infectious fever” prior to 1620. English settlers farmed, fished and logged the area around Hilton Point and near the falls of the Cocheco in what is now Dover, the oldest continuously occupied town in New Hampshire. Rochester was chartered in 1722 in the area around present day Gonic. Farmington was formed in 1798 and was part of the town of Rochester at that time.

By the mid 1600s lumber mills were being set up along the river and boat building became a growing industry. Shops that made products from the lumber and numerous brickyards using the clays from the banks of the Cocheco were also established.

In the late 1600s acts of Parliament ruled that all pines greater than 25 inches in diameter were the property of the King of England. These pines were felled for use as masts for military vessels. "Mast" roads were carved out of the forest to provide the shortest path to the river for transportation. Farming also came to the region and was practiced by many residents in order to assure self-sufficiency.

At the time of settlement in the early 1600s, the area was 96% forested. Increased forestry and farming began to reduce the forest cover especially the overstory trees. Elk and caribou, formerly native to the region, retreated to more forested areas and deer became more abundant. Beginning in the 1850s, sheep grazing became a growing agricultural endeavor to supply wool for mills. This period marked the time that forest cover was reduced to its lowest level of 39%. The current forest cover is approximately 81 % (Black, 2005).

In the early 1800s mills began to proliferate along the Cocheco. The Cocheco's abundant waterpower and nearby raw materials allowed for production of wool cloth and products, wood products, iron, machinery, tanned leather and leather products. Later, trains brought raw materials for manufacture to the area as well. Dover produced primarily cotton fabric and prints. Woolens were manufactured in Rochester and East Rochester, and tanned leather and shoes were produced in Farmington, Somersworth, Milton, Rochester and Dover.

By the early 20th century, farming was in decline and forests began to reclaim much of the farmland. Many mills moved out of the region by the 1940s and suburbanization began. Areas in the upper watershed became vacation camps for residents from cities to the south.

Landfills were located along the Cocheco in Farmington, Rochester and Dover. These included the Farmington Municipal Landfill, the Cardinal Landfill (largely industrial/commercial waste), Rochester municipal landfill near the old Granite Ford Building, and the Tolend Road landfill in Dover, a municipal landfill. All but the Farmington landfill are now closed but some remain a continuing source of groundwater pollution. Turnkey, the Waste Management Landfill, is located in Rochester Neck at the confluence of the Cocheco River and the Isinglass River. This is a fully lined landfill and appears to have no influence on the quality of groundwater or surface water nearby.

The Cocheco, which had become polluted by mill activity and the discharge of raw sewage, began its environmental renewal with the enactment of the Clean Water Act in 1972 (revised in 1977). Wastewater treatment plants (WWTP's) were built or improved

in Dover, Rochester and Farmington in the mid 1970s. Dover's WWTP was relocated downstream of the lower Cocheco Falls in Dover in the 1990s. Rochester's WWTP was significantly upgraded in the late 1990s. Farmington's WWTP has not yet been upgraded but there is a desire to improve the plant and possibly extend service in town.

Groundwater, wetland and shoreland protection measures enacted over the last two decades have also helped to safeguard natural resources and habitats but rapid growth has again put stresses on these resources. Increased suburbanization took an upturn in growth in the late 1970's. In the past five years even more rapid growth and commercial development has put additional pressure on the area. Stormwater runoff and increased stress on sanitary and storm sewers has taken its toll on the health of the watershed.

Human activities in the 21st century will pose many challenges for those engaged in keeping the Cocheco River watershed an attractive and vibrant place for people to live while also protecting the health of natural resources and wildlife habitat.

Cocheco River Subwatersheds

Subwatersheds are discrete drainage areas that make up a larger watershed. Subwatersheds were delineated by the US Geological Survey and were usually named for the streams that occupy that drainage area. There are five subwatersheds within the study area for the *Cocheco River Watershed Restoration and Implementation Plan*. These include the Upper Cocheco, Axe Handle Brook, Middle Cocheco, Lower Isinglass, and Lower Cocheco subwatersheds. Table 2 provides a summary of the characteristics of each subwatershed. Figure 2 illustrates the locations of these subwatershed areas. Many proposed actions within this plan are specific to these subwatersheds, and these designations will be used throughout the plan.

Table 2
Subwatersheds of the Cocheco River
(Subwatershed areas shown on Figure 2)

Subwatershed Name	Towns/Cities in Watershed	Area (square miles)	Characteristics
Upper Cocheco	New Durham, Middleton, Milton, Farmington	43.2	Largely rural and lightly developed in upper portions. Density around upper lakes and ponds increasing. Densely settled village area of Farmington and commercial zone on Route 11 in the lower portion of the subwatershed.
Middle Cocheco	Farmington, Rochester	24.9	Sand and gravel industries, Farmington waste water treatment plant, and landfills in upper portion. Lightly developed in middle portion. Lower portion heavily developed around urbanized areas of Rochester. Rapid suburbanization is decreasing the area of open lands in middle and lower portions of subwatershed. A large wetland complex, Heath Bog, occurs in this area.
Axe Handle Brook	Farmington, Rochester	11.6	Rural to light suburban development overall. Lower portion more heavily developed. Commercial/residential area near confluence of the brook with the main stem of the Cocheco River. Rochester Reservoir in this area.
Lower Isinglass	Rochester	22.8	Area around Gonic heavily settled. Includes Rochester wastewater treatment plant. Balance of area lightly settled, but becoming more suburbanized. Turnkey, the regional landfill is located in this subwatershed where it joins the Middle Cocheco subwatershed at Rochester Neck.
Lower Cocheco	Rochester, Dover, Somersworth	25.3	Lightly developed or suburbanized in upper subwatershed. Rapid growth in formerly rural areas. Densely settled and urbanized in lower subwatershed in Dover City Center. Large wetland complex at the Hoppers and along the Blackwater Brook. Important wetlands also surround Gonic Hill near the northern boundary of the subwatershed.

Section 3 - Restoring the River – A Working Partnership

The Cocheco River Watershed Coalition

The Cocheco River Watershed Coalition (CRWC) emerged in 1998 after a year of citizen exploration of the watershed with guidance from Strafford Regional Planning Commission and Strafford County UNH Cooperative Extension, and funding from New Hampshire Estuaries Project (NHEP). In 1999 a small group committed to organizing river protection set goals and bylaws for the group. They began to tackle the issues identified in preliminary investigations of water quality, public access and environmental conditions. Initial activities included canoe trips, riverside cleanups, youth programming and water quality monitoring. The CRWC goals are as follows:

The Coalition wants watershed communities to regard the river as an asset, to foster the environmental health of the river and to derive benefits from the river.

The Coalition wants healthy fish populations in the watershed as indications of ecological well-being and for recreation and consumption.

The Coalition wants citizens of the watershed to have access to a clean, healthy river and to develop a stewardship ethic regarding the watershed.

In this unique partnership the grassroots-based CRWC draws on the educational resources of Strafford County UNH Cooperative Extension and the technical resources of state resource agencies. Since 1999, water quality monitoring has been refined and expanded with continued NH Coastal Program and DES support. CRWC has published river guides including The Cocheco Sampler, published in 2000, which is an introductory guide to exploring the watershed. The Public Access Guide, 2003, introduced the public to the access points and recreational opportunities along the river and upland in the watershed. The group also assessed headwater streams and fish habitat and, most recently, conducted biological monitoring along segments of the main stem of the River.

Meanwhile watershed communities are turning to the river with new interest in planning, management and protection. Much of the investigation is focused on the river because conditions in the river reflect the environmental status of the larger watershed. Because water travels downhill and downstream, conditions upland and upstream effect conditions downstream in the more densely populated communities of the Cocheco River Valley.

The voluminous data volunteers have gathered were summarized in agency reports, resting on shelves and not particularly interesting reading for the citizen volunteers who make decisions in our communities. This restoration planning project began with writing of the *Cocheco River Watershed Environmental Quality Report* (EQR (Fargo & Truslow, 2005), based on all the data available and presented in relation to the prevailing watershed issues. It was written for community decision-makers (actually all of us make

decisions that effect the watershed) to use as a basis for restoration and other management activities in the watershed.

This new restoration plan draws on that EQR and the collective wisdom of citizen participants from throughout the watershed. For Cocheco River Watershed Coalition members, it is a culmination of seven years of information gathering, exploration and recreation on the river. It is also the beginning of a period of opportunity for citizens and communities in the watershed to take action, which will improve the quality of our environment.

Why Restore Now?

Thanks to the actions of citizens, municipalities and organizations in the area, restoration of the Cocheco River is ongoing. From the progress made through wastewater treatment plant improvements, point source discharge reduction, and landfill cleanup to land protection and improved stormwater treatment methods there are positive changes along the river. The economic growth of the area and the corresponding commercial, industrial and residential development will place strains on the health of the watershed and ultimately, the river, even with incorporation of good planning and management.

The rural communities in the Upper and Middle Cocheco, which lack extensive infrastructure, are under increasing development pressure. The mostly volunteer municipal boards – planning, zoning and conservation – need reliable information about the watershed so that good decisions can be made about land use. It is hoped that all watershed towns will adopt this plan as part of their master plan and see that their decisions may affect other areas up and down the watershed.

As more focus turns to quality of life, economic vitality, and rejuvenation of towns and cities, there is a growing understanding of the importance of the river to the overall health of the communities through which it flows. The plan is timely for all of these reasons and provides a foundation to coordinate efforts between citizens, agencies and municipalities.

Towns and Cities in the Watershed

A total of thirteen towns or cities lie within the larger Cocheco River Watershed. Seven towns or cities occupy the study area included in this plan and they are Middleton, New Durham, Milton, Farmington, Rochester, Somersworth, and Dover (See Figure 2). New Durham is the most rural of the towns and is lightly settled. Middleton has a village center on Sunrise Lake, but most of the remaining area remains lightly developed. Both New Durham and Middleton have multiple ponds and tributaries that contribute to the Cocheco in this headwaters area. The portion of Milton that is within the watershed is also quite rural and hilly. The portion of Somersworth within the watershed is rural to lightly settled suburban type development.

The cities of Rochester and Dover are the largest communities in the watershed and were the most industrialized. The heavily settled areas of Farmington, Rochester and Dover

are clustered along the main stem of the Cocheco as transportation, energy and water for consumption were historically derived from the river. Farmington, Rochester and Dover are also actively working to improve infrastructure that will help to improve water quality and prevent future degradation of the river.

Working Together

The CRWC has a history of working together with municipalities, businesses, community organizations and agencies to understand and improve the river. The success of restoration will be based on the good will that the organization has built since its formation in 1998. The individuals that made a significant contribution to this restoration plan through interviews, river tours, and participation on the restoration planning committee are listed in Table 3. The committee that developed the goals, objectives and many of the actions described in the plan represent this broad constituency. The actions will be carried out using this model of cooperation.

Table 3
Key Participants in the Cocheco River Restoration Planning Process

Name	Affiliation	Town/City
George Bailey	Conservation Commission, Chair (retired)	Rochester
Norma Bard	Cocheco River Watershed Coalition, Treasurer	Dover
Anna Boudreau	Strafford Rivers Conservancy, Executive Director	Dover
Lorie Chase	Cocheco River Watershed Coalition, Project Coordinator	Barrington/Dover
Tom Clough	Educator	Rochester
Irene Creteau	Cocheco River Watershed Coalition, Vice Chair, NH Legislator	Rochester
Alan Davis	Waste Management, Inc, Turnkey Landfill Manager	Rochester
Joyce El Kouarti	Dover Open Lands, Former Director, Moose Mt. Regional Greenways	Dover
Paul Esswien	Town of Farmington, Planner	Farmington
Tom Fargo	Dover Open Space Committee, Conservation Commission Chair, Strafford Regional Planning Chair	Dover
Bob Goldstein	Former Rochester City Council	Rochester
Lauren Jacoby	Cocheco River Watershed Coalition, Exec. Committee	Dover
Charlie King	Farmington Planning Board, Chair	Farmington
Ed Mullen	Conservation Commission, Former Chair, Cocheco River Watershed Coalition Member	Farmington
John Nolan	Rochester Times, Editor	Rochester/Strafford
Paul Perry	Cocheco River Watershed Coalition, Member	New Durham
Dean Peschel	Dover Community Services, Environmental Projects Manager	Dover
Bill Sammis	Cocheco River Watershed Coalition, Executive Committee	Rochester
Cal Schroeder	Cocheco River Watershed Coalition, Chair, Former County Commissioner, Strafford Conservation Commission	Strafford
Sue Snow	Cocheco River Watershed Coalition, Secretary	Somersworth
Brian Stern	Dover Open Lands, NH Technical Advisory Group	Dover
Tom Willis	Rochester Public Works Department, City Engineer	Rochester
Jeff Winders	Cocheco River Watershed Coalition, Executive Committee, Rochester Conservation Commission	Rochester

Section 4 - Current Watershed Conditions

Water Quality

From 1999 to 2003, volunteers and staff of CRWC collected and tested over 750 samples for water quality along the length of the Cocheco River. The 2005 *Cocheco River Environmental Quality Report* (EQR) reviewed and analyzed the data collected from 1999 to 2003. The focus of study of the EQR was the analyses and interpretation of dissolved oxygen, pH, bacteria, metals and nutrients data from a variety of reports and monitoring programs. These are indicators of water quality related to State water quality standards and were the parameters most often completed by CRWC volunteers during the recent water quality sampling history.

Historical impacts on water quality include clearing of land for farming and timber harvesting, waste discharge from mills, stormwater runoff and direct discharge of sewage to the river, and treated effluent from wastewater treatment plants. Contaminated groundwater also discharged to the river from unlined landfills and commercial and industrial activities in the many sand, gravel and clay deposits. Current impacts are documented from closed and active landfills, wastewater treatment plant discharge, untreated septic/sewage discharge, stormwater runoff, unstable road crossings, and erosion and resulting sedimentation from construction activities along its course.

The following discussion of water quality is based on the findings of the EQR, which includes information about the State's assessment of waterbodies. A summary table of this information is included in Appendix A.

The State of New Hampshire water quality standards provide baseline guidance that all surface waters of the State must meet in order to protect their intended uses. These standards are the "yardstick" for identifying where water quality violations exist. They also help determine the effectiveness of restoration and pollution prevention programs (NHDES, 2004). The standards are divided into three parts, which are (1) designated uses, (2) water quality criteria and (3) anti-degradation.

Designated uses represent the factors or activities that a water body should support. There are seven designated uses that the water quality standards are intended to protect. These designated uses are as follows: aquatic life, fish consumption, shellfish consumption, drinking water supply, primary contact recreation (e.g., swimming), secondary contact recreation (e.g., boating), and wildlife. Water quality criteria are designed to protect the designated uses of all surface waters and are expressed in either numeric or narrative form. A waterbody that meets the criteria for its assigned classification is considered to have attained its intended use (NHDES, 2004).

The third and final component of the water quality standards is antidegradation which includes the provisions designed to preserve and protect the existing beneficial uses and to minimize degradation of the State's surface waters. For example, antidegradation applies to any proposed new or increased activity that would lower water quality or affect the existing or designated uses.

DES defines each designated use in the *2004 New Hampshire Consolidated Assessment and Listing Methodology* (CALM). The following table (Table 4) was taken from that

publication. It lists each use, definitions and the applicable surface waters for which assessments are completed.

Table 4 Designated Uses of State Surface Waters

Designated Use (Applicable surface waters)	Department of Environmental Services' Definition
1. Aquatic Life (All surface waters)	Waters that provide suitable chemical and physical conditions for supporting a balanced, integrated and adaptive community of aquatic organisms.
2. Fish Consumption (All surface waters)	Waters that support fish free from pollution at levels that pose a human health risk to consumers.
3. Shellfish Consumption (All tidal surface waters)	Waters that support a population of shellfish free from toxicants and pathogens that could pose a human health risk to consumers.
4. Drinking Water Supply (All freshwater surface waters)	Waters that with conventional treatment will be suitable for human intake and meet state/federal drinking water regulations.
5. Primary Contact Recreation (All surface waters)	Waters suitable for recreational uses that require or are likely to result in full body contact and/or incidental ingestion of water (such as swimming).
6. Secondary Contact Recreation (All surface waters)	Waters that support recreational uses that involve minor contact with the water (such as boating or fishing).
7. Wildlife (All surface waters)	Waters that provide suitable physical and chemical conditions in the water and riparian corridor to support wildlife as well as aquatic life.

DES determines if surface waters of the State meet certain uses based on available data from DES monitoring efforts and other organizations' data. These determinations are made for what DES calls "assessment units or AUs." Each waterbody type in the State (river, stream, lake, pond, estuary, ocean) was divided into smaller segments, which are the AUs. AUs are the basic unit of record for conducting and reporting the results of all water quality assessments (NHDES, 2004). Each of the designated uses, with the exception of wildlife, has a methodology that is used to make an assessment decision. An assessment methodology for wildlife has not yet been developed.

The five subwatersheds covered in this report have numerous assessment units ranging from six in the Lower Isinglass to twenty-one in the Lower Cocheco. Each assessment unit (AU) is evaluated to determine if the designated uses are met for the River. Two of the seven uses were not assessed. The shellfish consumption use is not relevant in freshwater bodies. And, as mentioned previously, an assessment methodology has yet to be developed for wildlife uses. The drinking water use was assessed for only one AU, which is the Rochester Reservoir in the Axe Handle Brook subwatershed.

As is the case for all of the state's freshwater waterbodies, the fish consumption use is impaired based on mercury pollution from atmospheric deposition. The three remaining uses were assessed for each AU, if data existed for the indicators needed to assess each use. The following section summarizes water quality information classified according to

aquatic life use, primary contact recreation and secondary contact recreation as described above. The discussion and tables are divided by the subwatersheds included in the Cocheco Restoration Study Area. The locations of these subwatersheds are illustrated in Figure 2.

Upper Cocheco

The Upper Cocheco does not meet the standards for aquatic life use in five of its nineteen AUs. The causes of this problem include low pH levels in four of the AUs (main stem of Cocheco and Mad River) and the presence of nonnative aquatic plants in Sunrise Lake. DES lists the sources of these impacts as unknown. Also, the standard for swimming (primary contact recreation) is not met for two AUs in the main stem of the river. DES lists the source of the bacteria as unknown. The EQR notes that failing septic systems are suspected in the area between Central and Spring Street as well as other areas in Farmington.

Threats to water quality include sprawl and increasing residential and commercial development in outlying portions of Farmington, especially from inadequate on-site waste disposal systems. These factors, especially housing developments that encroach into sensitive riparian areas are also mentioned as threats to other natural resources.

Upper Cocheco Impairment	Causes	Sources
Aquatic life	pH & nonnative aquatic plants	unknown
Primary Contact Recreation	bacteria	Failing septic systems

Axe Handle Brook

Axe Handle Brook does not meet the standards for aquatic life use in two of its nine AUs. The cause of the problem is low pH levels in Howard Brook and Baxter Lake. The reason for these low pH levels is currently unknown. The assessment unit for Howard Brook does not meet the standards for either primary or secondary recreation based on bacteria levels. The source of the bacteria is listed as livestock and indicates that livestock wastes are directly deposited or are carried to the brook by stormwater runoff.

The threat to this subwatershed is the increase in residential development including the impacts from increased stormwater runoff and septic systems.

Axe Handle Brook Impairment	Causes	Sources
Aquatic life	pH	unknown
Primary Contact Recreation	Elevated bacteria	livestock
Secondary Contact Recreation	Elevated bacteria	livestock

Middle Cocheco

The Middle Cocheco does not meet the standards for aquatic life use in six of its thirteen AUs. These six AUs include parts of the Cocheco River main stem, Pokamoonshine Brook, Rattlesnake River, and the 50-acre AU at the City Dam. The causes vary but all have low pH values. Other causes include low dissolved oxygen, elevated aluminum levels, and poor results from habitat and biological surveys, in addition to nonnative aquatic plants present at the City Dam. The EQR notes that the elevated aluminum levels may derive from a combination of natural causes and analytical technique. These aluminum levels may also be a result of sedimentation from stormwater runoff.

The upper-most assessment unit is impacted by the groundwater discharge to the river in the vicinity of the Farmington and Cardinal landfills. DES is in the process of conducting a total maximum daily load (TMDL) including an analysis of the Farmington wastewater treatment facility and the infiltration of contaminated groundwater into the Cocheco River down gradient of the Cardinal and Farmington landfills. Groundwater monitoring has shown elevated nitrate and biological oxygen demand (BOD) down gradient of the Farmington septage lagoons. Concentrations of these contaminants have been observed to increase during dryer seasons and decrease during wetter seasons.

The EQR shows that changes in pH and dissolved oxygen are linked. This relationship suggests that correcting the problems manifested in impaired dissolved oxygen levels may also improve what appears to be a problem with pH levels in the Cocheco River.

The EQR also described degraded stream and riparian habitat based on a survey conducted by EPA in 2001. The surveyed section of the river at Little Falls Bridge reportedly has a good number and diversity of macro-invertebrate organisms, but received low scores overall due to a degraded riparian buffer, namely poor riparian vegetative cover, poor bank stability, and excess sedimentation.

Primary contact recreation is impaired in four of the assessment units, which include the upper main stem, Pokamoonshine Brook and two middle portions along the Middle Cocheco subwatershed. Boating, or secondary contact recreation, is not supported in the upper main stem of the Cocheco River. The recreation uses are not supported based on elevated bacteria levels. The source of the bacteria is listed as unknown.

The EQR notes that illicit discharges into the storm drainage system and cross connections of storm and sanitary sewers are suspected to exist in the older downtown sections where infrastructure is aging. Another persistent site for elevated bacteria levels is 23-Cch and while various sources are suspected more investigation is needed to identify the sources. The EQR states that the seasonal camps at the Rochester Fairgrounds are not serviced by a properly constructed septic system or the City sewer system. Efforts are underway to remedy the situation. In addition, manure storage at the fairgrounds is not adequate. Fairgrounds management has recently sought funds to construct proper manure storage facilities.

Middle Cocheco Impairment	Causes	Sources
Aquatic life	Low pH, low dissolved oxygen,	pH & DO = suspected to be landfills & WWTF/lagoon discharges
	Elevated aluminum	Al=natural causes, stormwater sedimentation
	Poor results from habitat & biological surveys, non-native aquatic plants	Habitat & biological surveys=poor riparian vegetative cover, poor bank stability and sedimentation
Primary Contact Recreation	Elevated bacteria	Illicit discharges and possible cross connections
		Failing septic systems
		Animal waste
Secondary Contact Recreation	Elevated bacteria	Same as above

Lower Isinglass

The Lower Isinglass does not meet aquatic life uses in one of its six AUs. The cause of the problem is low dissolved oxygen levels in the main stem of the Cocheco River. The source of the impact is listed as municipal point source discharge. The AU of the Cocheco River at the Gonic Pond dam also does not meet the standards for primary contact recreation based on bacteria levels exceeding the standard and the sources are listed as unknown.

Lower Isinglass Impairment	Causes	Sources
Aquatic life	Low dissolved oxygen	Municipal point source
Primary Contact Recreation	Elevated bacteria	Unknown

Lower Cocheco

The Lower Cocheco contains twenty-one assessment units and four do not meet the aquatic life use designation. The cause of the problem is low pH levels in the main stem including the areas behind the Waldron Dam and the Central Avenue Dam and the source is listed as not known.

The EQR states that the largest uncontrolled landfill in Dover is the former municipal landfill on Tolend Road. Groundwater seeps along the bank of the river, associated with the so-called eastern plume (subsurface pollution), are impacting the river's quality.

On the positive side, the EQR notes that the fish diversity and population represented at the Cocheco fish ladder is superior to that found at other fish ladders in coastal New Hampshire. The greatest threat to spawning habitat is low water levels. Dissolved oxygen and temperature, which can be related to water depth, are also major factors in fish habitat quality.

Primary contact recreation is not being met in two of the twenty-one assessment units based on elevated bacteria levels. One of the two AUs is located in the upper portion of the subwatershed on the main stem and the other is a 20- acre AU above the Central Avenue Dam. The source of the elevated levels in the AU near sampling site 10-Cch is unknown but illicit discharges into stormdrain systems are listed as the source for the Central Ave Dam AU. The EQR also notes that there are known septic system failures in the Reyners Brook drainage area. The City of Dover is pursuing funds to extend sewer service to this area.

Lower Cocheco Impairment	Causes	Sources
Aquatic life	pH	Unknown, Tolend Rd landfill discharge suspected
		Low water levels
Primary Contact Recreation	Elevated bacteria	Illicit discharges and possible cross connections
		Failed septic systems

Watershed-wide River Quality Issues

Toxic metals

Although impairments caused by toxic metals are not documented, with the exception of the aluminum impairment in the Middle Cocheco, the EQR shows that copper and lead are potentially toxic metals that appear to occur at elevated concentrations at various sampling locations along the river. Sources are suggested to include discharges from wastewater treatment facilities, usually attributed to corrosion of household plumbing fixtures**.** Fish tissue samples collected statewide by the USEPA and DES show elevated mercury levels. This is thought to be largely a result of air pollution from power plants and incinerators. Air pollution reaches the ground during precipitation events and flows into surface waters where pollutants are ingested by fish through their gills and mouth.

Toxic Metal Threats	Causes	Sources
Aquatic life	Toxic metals	Wastewater treatment plant effluent
Fish Consumption	Elevated mercury levels	Atmospheric pollution

Nutrients

Nitrogen and phosphorus compounds are considered to be nutrients. When dissolved in surface water, these compounds provide aquatic plants with the food (nutrients) to thrive. However some of these aquatic plants can overtake ponds, wetlands, streams and rivers if too many nutrients are present.

Similar to land application of these compounds on crops and gardens (fertilizer), some nutrients are absolutely necessary to healthy plants, but too much can damage surface water environments. Excess nutrients can lead to vegetative blooms that damage stream and river ecosystems and can eventually deplete dissolved oxygen from surface waters. Excessive concentrations of certain nutrient compounds (in particular, nitrite) can also cause harm to humans if consumed for drinking water.

Phosphorus is often the limiting nutrient in freshwater aquatic systems. That is it is often in short supply compared to other nutrients and therefore surface waters are often more sensitive to excess phosphorus than excess nitrogen.

The source of excess nutrients can be from wastewater treatment plant discharge, failed septic systems or direct discharge of septage to surface water. In addition, pet and livestock waste runoff, excess fertilizer runoff from agriculture and landscaping can also be a source of increased nutrients. Along the Cocheco, it was phosphorus that exceeded State water quality standards in over 60% of samples taken. Nitrogen exceeded limits in only 11% of samples. Future sampling and analysis of these excess nutrients requires more attention to pinpoint and reduce sources of this contaminant.

Nutrient Threats	Causes	Sources
Aquatic Life	Phosphorus concentrations increase and result in algae blooms and low dissolved oxygen.	Removal of riparian buffers Wastewater treatment plant discharges. Agricultural and pet waste runoff. Fertilizers from households and agricultural uses.
Primary & Secondary Recreation	Phosphorus concentrations increase and drive algae blooms and increases in aquatic weeds.	Same as above

Riparian and Aquatic Wildlife

As mentioned previously, DES does not conduct an assessment for wildlife use at this time**.** The habitat of the Cocheco River corridor and its tributaries has not been widely studied, but it is beginning to receive more attention. The New Hampshire Fish and Game Department (NHFG) keeps records of fur bearing mammals trapped and deer hunt totals each year. This survey indicates a healthy population of mammals ranging in size from mink to deer. NHFG also tracks the amount of fish returning to the ladder at Cocheco falls in Dover. Of these species, river herring (alewives and blueback herring) were the most abundant. In 2004, over 70,000 fish were counted on their return upstream. Challenging upstream habitat can limit the success of these fish, especially shallow waters and areas of the river containing low dissolved oxygen.

The EQR mentions that the NHFG conducted a habitat quality mapping project recently and once available, these maps will provide much needed information about terrestrial habitat. Fragmentation of habitat is a rapidly growing problem. The Society for the Protection of New Hampshire Forests (2005) reports that substantial land conversion from forest and farmland to developed uses is now occurring along and between the State's major transportation corridors including Route 16 (Spaulding Turnpike). SFNHF also reports that New Hampshire is gradually losing the values provided by extensive forests, including their contribution to wildlife habitat, losing about 17,500 acres per year largely to development. Forest blocks big enough to support significant wildlife habitat are already sparse in the Seacoast (SPNHF 2005), meaning preservation of the remaining forests is critical for protecting habitat and wildlife.

A study conducted by USEPA at the Little Falls Bridge in Rochester showed several factors to be compromising the health of the river in this location. Of these factors, lack of protective plants along the rivers edge, erosion of the stream bank and sediment deposition in the water effected the health of that section of river the most. Based on knowledge of stream condition in other areas, this is a common problem on the Cocheco. Recent studies have shown that valuable habitats and biological communities occur along the Cocheco River. Special protection measures will likely be required to safeguard these and surrounding areas of the river.

Riparian and Aquatic Wildlife Threat	Causes	Sources
Wildlife	Habitat fragmentation Loss of riparian vegetation Erosion of stream banks Sedimentation	Development along transportation corridors Conversion of forest lands to developed uses Removal of buffers along headwater streams and the main stem of the river.

Solid Waste Dumping

The banks of the Cocheco have been a dumping place for some time. Historically, landfills were located along the river's edge in Dover, Rochester, and Farmington and contributed to pollution of the river. All of these areas, except for the municipal landfill in Farmington, have now been closed. Dumping of household debris and other refuse along the Cocheco River corridor has also long been a problem. This is especially true in areas where stream banks are steep and the river is generally out of sight of everyday automobile and pedestrian traffic. CRWC has engaged citizens and towns in several cleanups since 1997, collecting a total of approximately 5,745 pounds of materials. This problem will continue to receive attention as part of restoration as it is a visible sign of stewardship of the river.

Solid Waste Impairment	Causes	Sources
Wildlife	Riparian habitat destruction	Dumping of household debris on banks
		Dumping of debris from businesses

Stormwater Runoff, Development and Impervious Surfaces

The population of the Cocheco River watershed is expected to increase by over 20% in the next 20 years. Populations are projected to increase by twelve percent (12%) in Dover and up to fifty-eight percent (58%) in New Durham from 2000 to 2020 (Fargo and Truslow, 2005). As development increases along the river, the amount of paved area and buildings covering the ground will increase correspondingly.

These hard surfaces where water cannot easily absorb into the ground are referred to as *impervious surfaces*. As impervious surface area increases, stream water quality and habitat impacts are observed (USGS, 2005). Impervious cover as little as seven percent (7%) can effect the quality of the receiving water and aquatic habitats (USGS, 2005). The EPA states that excessive polluted stormwater runoff is one of the most difficult impacts of urbanization to control and correct (EPA, 2005). And, DES lists stormwater as the State's number one priority nonpoint source (NHDES, 1999).

Water quality impairments in the watershed do not explicitly mention stormwater as a source, however several of the sources for aquatic life and recreational use impairments are listed as "unknown." There has not been a study or monitoring program done to measure the impacts of stormwater on the water or habitat quality in the watershed.

The subwatersheds have varying degrees of impervious cover. Fargo and Truslow(2005) state that the amount of developed land could double in the next twenty years. Development, particularly the creation of impervious surfaces, increases the rapidity with which precipitation or stormwater runs off developed areas. As impervious surfaces approach seven to fourteen percent coverage of these watersheds, water quality and habitat impacts are very likely (USGS, 2005).

Current stormwater pollutant load estimates for each subwatershed are listed below. Estimates were calculated based on the Simple Method (CWP, 2000). More information about how the pollutant loads were calculated is provided in Appendix B. The Simple

Method was used to calculate stormwater pollutant load estimates for bacteria, total suspended solids (TSS) and total phosphorus. The information needed to use the Simple Method includes subwatershed drainage area, impervious cover area, stormwater runoff pollutant concentration and annual precipitation. Pollutant loads are estimated as a product of annual runoff volume and pollutant concentration. In the Simple Method, the runoff coefficient is calculated based on the percentage of impervious cover in the subwatershed. As such, the subwatersheds with the higher percentage of impervious cover (Table 5a) yielded greater pollutant loads (Table 5b)

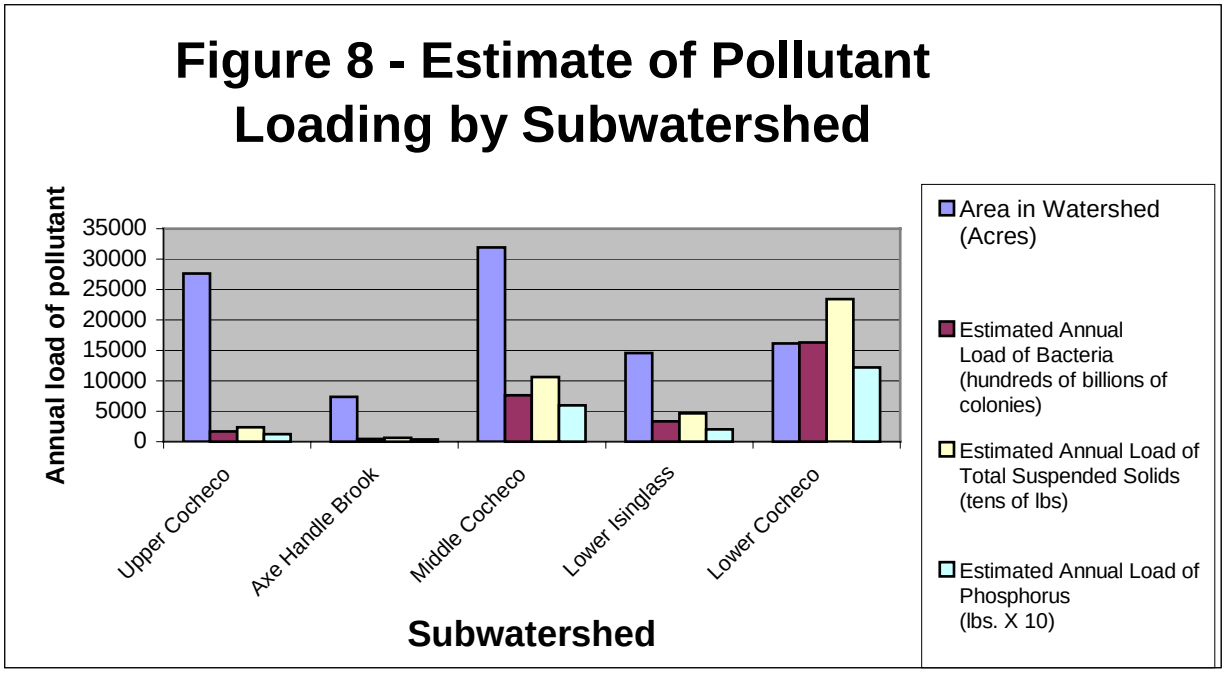
Table 5a

Impervious Surfaces by Subwatershed

Land Use/Impervious cover %	Upper Cocheco	Axe Handle	Middle Cocheco	Lower Isinglass	Lower Cocheco
Total % used in pollutant load estimates	1.5%	1.0%	4.7	3.1	12

Table 5b
Estimated Annual Bacterial, Total Suspended Solids and Phosphorus Load

Subwatershed Name	Area (Acres)	Estimated Annual Load of Bacteria (billions of colonies)	Estimated Annual Load of TSS (lbs)	Estimated Annual Load of Phosphorus (lbs)
Upper Cocheco	27,616	141,415	20,319	108
Axe Handle Brook	7,396	37,045	5,242	25
Middle Cocheco	31,905	636,333	88,703	517
Lower Isinglass	14,593	250,120	34,280	147
Lower Cocheco	16,146	1,049,605	148,799	790



As shown in Figures 8 and Tables 5a and 5b, the Lower Cocheco subwatershed contributes the greatest pollutant load for all three parameters. In addition, the Lower Cocheco watershed area contributes almost double the load for bacteria and TSS when compared to the Middle Cocheco, the subwatershed with the next highest pollutant load. The percentage of impervious cover is estimated at 12% in the Lower Cocheco, which exceeds the percentage at which water quality impacts to streams are typically observed. The Middle Cocheco impervious cover percentage approaches the threshold range of 10% where research indicates that the most sensitive functional stream elements are lost from the system (USGS, 2005 and Zielinski, 2002).

The USEPA began to focus on stormwater pollution as part of the Federal Water Quality Act of 1987. In 2003, municipalities of a certain size (called MS4s) were required to address reduction of stormwater runoff and improvement of stormwater quality through innovative technologies and the involvement of local governments using land use controls. Both Rochester and Dover are considered MS4 communities by the USEPA, because they contain "urbanized areas" as defined by the U. S. Census Bureau in the 2000 census. Farmington is not considered an MS4 community and is therefore not required to initiate these activities by law at this time. Dover and Rochester are required to reduce the discharge of pollutants to the maximum extent practicable in the urban centers, protect water quality and meet the requirements of the Clean Water Act. This means that the best management practices used by the community must not create an impairment of use or further degrade an impaired waterbody.

The threats and suspected causes of some impairment in the watershed are shown in the table below. Both the quantity and quality of stormwater are issues for all subwatersheds.

The urban centers of Dover, Rochester and Farmington contribute stormwater loads to the river as well as the residential development that surrounds the urban centers and is scattered in the rural and suburban parts of the subwatersheds. Development on small, feeder streams can create stresses on the headwater streams in terms of water quantity by reducing infiltration of stormwater and subsequent recharge of these streams and quality by discharging untreated stormwater from hard surfaces.

Stormwater Discharge Threat	Causes	Sources
Aquatic life	Polluted stormwater and increased stormwater volume. Decreased base flows. Scouring and incision of streambed. Unstable banks.	Uncontrolled and untreated stormwater from development (existing and new).
Primary Contact Recreation	Elevated bacteria	Untreated stormwater from development (existing and new.)
Secondary Contact Recreation	Elevated bacteria	Same as above

Additional work will be required in the watershed to design low impact developments and stormwater systems and to retrofit systems for existing development. Low impact development (LID) methods and innovative stormwater treatment designs are being tested and implemented in this and other countries. The efforts within the Cocheco River watershed can incorporate good stormwater management practices, LID and other innovative practices in order to limit the impact of this growing source of pollution to surface water. In order to eliminate these nonpoint sources of pollutants, land use controls such as zoning ordinances, subdivision rules and regulations, and septic system regulations will need to be strengthened (EPA, 2002). Compliance with federal Phase II stormwater regulations will also require adoption of stormwater regulations to achieve compliance and promote low impact development.

Gaps in Water Quality Data

Appendix A includes a table that lists the water quality of the assessment units in the subwatersheds summarized above. While this section describes the impaired waters and the causes for impairment, it is important to note that many waters have not been assessed by the State based on a lack of data or in the case of use by wildlife, a lack of an assessment method. For example, only four of the 21 AUs in the Lower Cocheco have been assessed for aquatic life use. This means that there is a large gap in our understanding of how healthy the river is in the subwatersheds, especially in terms of its ability to support aquatic organisms and other wildlife. The monitoring plan recommends new and enhanced environmental monitoring to fill data gaps with the goal of assessing all the waterbodies for the designated uses.

A complete list of the AUs and the associated impairments is located in the Cocheco River Watershed Environmental Quality Report (Fargo and Truslow, 2005), and in Appendix A of this report.

Commercial and Recreational Opportunities

Recreation and enjoyment of the river by residents and visitors has and will continue to help in restoration efforts. Recreation provides participants with the opportunity to view and understand the natural history and present conditions of the river, which may spur increased stewardship. Many already enjoy the river corridor and tributary streams for passive recreation including walking, skiing, skating, boating, and birdwatching. Future opportunities for increasing recreation could include making the river more accessible for recreation and for viewing.

Efforts to incorporate the river into commercial redevelopment plans include beautification of the urbanized sections of the river in Rochester and Dover and improvement and increase of access points to the river for fishing and enjoyment. With the increase in visibility brought about by Rochester and Dover riverwalks and increased interest in canoeing, kayaking and fishing along the Cocheco, public awareness should increase, but much work waits to be done.

Section 5 - Our Vision for Cocheco River

The Goals of Cocheco River Restoration

Volunteer Sampling – Cocheco River

As part of the restoration planning process, interviews with citizens, officials and organizational leaders were conducted in order to establish an understanding of what local decision makers hoped for the future of the river. In addition, a restoration-planning group was formed to establish the goals, objectives and actions to be carried out as part of the Cocheco River Restoration project. The goals of the CRWC were used as a starting point for creating the goals for Cocheco River Restoration process (see Section 3 of this report). These goals were modified and supplemented to create the goals for restoration. The four goals established for restoration are:

- *Public Perception and Education Goal - Change the negative public perception of and behavior toward the Cocheco River so that the assets and benefits of the Cocheco River can be realized.*

- *Water Quality Restoration Goal - Improve the water quality of the Cocheco River to meet New Hampshire Class B water quality standards by 2015.*

- *Habitat Improvement Goal - Understand and improve the instream and riparian habitat of the River to assure the ecological well being of the Cocheco River.*

- *Development and Stormwater Impact Goal - Minimize the impact of current and future development and infrastructure and associated stormwater impacts on the Cocheco River watershed.*

What Does Watershed Restoration Mean?

As reviewed in this report and the EQR, the landscape, settlement patterns and impacts on the Cocheco vary widely from the upper watershed to the Cocheco Falls in Dover. However, the benefit of restoration will effect all citizens who use and live within the watershed and those downstream of the study area.

How the watershed and river corridor will be restored depends on the current condition of the river in that segment, what is currently being done to improve conditions in that area, and the will of individuals and governments to effect positive change. Restoration will be based on an adaptive management model. As more is learned about the conditions along the river, restoration plans can be modified to suit those changing conditions. In addition, methods of treatment considered to be current today, will be replaced by new and improved methods in the future. This plan will be reviewed year to year in order to reflect these changes in understanding of the river and advances in pollution prevention and restoration.

There is still much to learn about the current conditions along the river and the impacts that existing settlement and development on these sections. For example, in the Upper Cocheco watershed, although lightly settled, development around Chalk Pond, Sunrise Lake and the streams that flow from these ponds will effect the health of these areas and downstream conditions as well. In the heavily settled areas of Farmington, Rochester and Dover, impacts include large areas of impervious surface and corresponding stormwater runoff, aging infrastructure and illicit sewer discharges and cross connections between storm sewers and sanitary sewers, loss of riparian buffers along tributary streams, and dumping of solid waste along the river's edge.

Restoration activities could include:

- Surveying streamside (riparian) buffer conditions and biological communities.
- Detecting illicit sewer discharges and cross-connections
- Retrofitting stormwater discharge areas with innovative stormwater pre-treatment systems
- Encouraging the use of low impact development for new commercial, industrial, and residential development and re-development.
- Evaluating the economic and cultural value of the river to the community.
- Educating citizens about the Cocheco River and the benefits of river stewardship
- Increasing water quality monitoring in upstream areas.
- Re-designing monitoring programs to address specific problem areas.
- Understanding effects of withdrawal from and discharge to the River for commercial and municipal purposes.
- Developing demonstration areas for streamside buffers, snow dumping, stormwater management and educating citizens using these areas as a model.
- Restoring stream buffer function, habitat and recreation areas along smaller urban streams and the river corridor.

Examples of Watershed Restoration

Watershed restoration is taking place worldwide as city and town planners and citizens are rediscovering the value and beauty of their local streams and rivers. Here in New Hampshire efforts are underway on Hodgson Brook, a highly altered and urbanized stream that flows to North Mill Pond, a tidal inlet, in Portsmouth. Small compared to the Cocheco River (only 3.2 square miles in total compared to the Cocheco's 100 square miles), the stream faces similar challenges on a smaller scale. The restoration plan for this stream was completed in 2004 (Truslow, 2004). Through the help of the Local Advisory Committee and the DES, they hired a coordinator to manage and oversee restoration activities in that watershed. Some of the activities that they are currently undertaking include storm drain stenciling, water quality sampling, and working with business on the Pease Tradeport and in Portsmouth to incorporate low impact stormwater management and development methods.

On a scale similar to the Cocheco, the Big Rock Creek Watershed (67 square miles) located in Tennessee is impacted through much of its length by similar stressors. In this watershed, vegetation along stream banks is being created or re-established to prevent erosion and to establish an in-town greenway (CWP, 2003). This practice also provides valuable habitat for birds, invertebrates and small mammals.

The Rouge River in Michigan, which flows through Detroit, is another urban watershed that is being transformed. This river has been impacted by agricultural runoff, urbanization and intensive recreation. An ambitious program of investigation, retrofit demonstration areas, and outreach is effectively improving water quality, habitat and awareness of the impacts of intensive use on the river. A website has been developed by the Rouge River Project Team to help local communities along the Rouge understand the condition of the Rouge in their area and implement change along their reach of the river (www.rougeriver.com). The website lists a remarkable breadth of projects that have been completed to address the multiple impacts to the watershed. (Truslow, 2004)

Benefits to Citizens, Business and the Towns and Cities in the Watershed

There are numerous benefits to restoration of the Cocheco River. Throughout the planning process, key benefits were discussed. These benefits are listed below the associated goal developed for the restoration plan.

Public Perception and Education Goal

- Citizens and municipal leaders will understand the value of the river and increase stewardship for and responsibility to the river.
- Citizens and visitors will want to enjoy and use the river for recreation.
- Restoration of the river will beautify downtown and neighborhood areas of Farmington, Rochester and Dover.
- Restoration of the river will lead to establishment of entertainment, shopping, and dining areas along the restored river segments in urban areas

- River restoration will increase property values.
- River restoration will provide opportunities for river resource education.

Water Quality Goal

- Improved water quality will allow for greater recreational opportunities including swimming, boating, and fishing.
- Decreased nutrients will reduce aquatic vegetation– this will improve the aesthetics of the river (sight, smell) and improve habitat for fish and other stream dwelling animals.
- Improved water quality upstream will result in cleaner water discharging to the tidal portion of the Cocheco and the Great Bay Estuary, therefore improving the water and habitat quality of the estuary.

Habitat Improvement Goal

- Improved buffers along the river and its tributaries will improve river functions such as flood control and pollution attenuation.
- Improved river habitat will allow anadromous fish such as brown trout, alewives, and eels, to establish breeding areas upstream of tidal dams.
- Freshwater fish populations will increase and diversify with improved river habitat and water quality.
- Natural communities will be re-established along the river.
- Improved habitats will encourage recreational use of and respect for the river.

Development and Stormwater Impact Goal

- Low impact development will decrease the cost of municipal public works, state and federal dollars needed to restore or maintain river quality.
- Reduced impervious surfaces will allow for groundwater recharge to sustain aquifers in the watershed and groundwater flow that maintains river levels.
- Reduced sediment and stormwater pollutants will prevent further degradation of water quality and habitat in the river.

Watershed Monitoring and the Watershed Restoration Plan

Monitoring of water quality has been ongoing for many decades. The CRWC took on increased monitoring responsibility with the assistance of DES in 1999. The results of this monitoring were summarized in the Cocheco EQR (Fargo and Truslow, 2005). Since publication of the EQR, CRWC has also undertaken biological monitoring of several segments of the River.

The revised program as described in the *Cocheco River Watershed Monitoring Plan - 2006 and 2007* (Truslow & Fargo, 2006) will build on the monitoring framework that has already been established will include additional tasks as follows:

- Acquiring additional sampling equipment for use by volunteers and staff.
- Training more volunteers to assist with surveying and sampling.
- Adding monitoring points on upstream reaches of the Upper Cocheco subwatershed in New Durham, Middleton and Farmington.
- Adding monitoring points on tributary streams throughout the lower subwatersheds.
- Modifying the monitoring program to identify contaminant sources along impacted sections of the river or tributaries.
- Adding more biological monitoring on tributary streams and upper watershed areas.
- Including biological monitoring in the annual monitoring program.
- Surveying riparian and instream habitat.
- Surveying solid waste along the main stem and major tributaries.
- Tracking illicit discharges and cross connection identification and correction.
- Documenting the effects of restoration activities.
- Tracking progress of environmental cleanup at Superfund and CERCLIS sites.

The results of this improved monitoring program will help direct restoration activities and track the progress of restoration methods on the water quality and habitat of the river and its tributaries.

Section 6 - Cocheco River Watershed Goals, Objectives and Actions

The following section describes the four goals established for Cocheco River Restoration and the associated objectives and actions developed to address these goals. Detailed action plans are included in Appendix C and a matrix of actions is included in this section.

A timetable and partnership profile has been established for each action. Partnerships already established between CRWC, state and local agencies, and associated organizations will be essential in implementing these actions. Additional partnerships and cooperative ventures will be established, especially in the private sector in order to make these long lasting and effective changes. Details of restoration implementation are included in Section 7.

Public Perception and Education Goal

Change the negative public perception of and behavior toward the Cocheco River so that the assets and benefits of the Cocheco River can be realized.

One of the most vigorously discussed issues in the planning process was the hope that this restoration program could change people's minds about the Cocheco River. Planning participants believe that many people in the watershed think of the river as polluted and messy and have no wish to use it or spend time improving it. Participants also believed that there was not a public understanding of how valuable the river is and could be to the economy and the well being of the communities. Until this perception was changed, it would be difficult to implement effective and long lasting restoration. The objectives and actions for this goal stem from this enthusiasm to change people's minds about the river.

Status of Public Perception and Education in the Watershed

The CRWC currently conducts tours of the river by canoe and kayak, distributes their river access guide, conducts riverside cleanups, and participates in many municipal events in an effort to spread the word about the value of the Cocheco River. In addition, the Strafford Rivers Conservancy, Moose Mountain Regional Greenways, Great Bay Coast Watch, and others have focused on protection of the river, emphasizing recreation and other benefits. Trout Unlimited and related groups also value the river for their activities.

Improvement along the river in Dover has been ongoing for over twenty years. This work includes the renovation and creation of the park at Pacific Mills and a portion of a riverwalk. It also includes establishment of the Cocheco Arts Festival that focuses on the riverside park in the downtown section of the river. Dover also created Henry Law Park and the covered footbridge below the lower dam in the downtown area to encourage more engagement with and appreciation of the river. A design charrette in 2005 projected additional improvements along the river downstream of the falls (CWDAC, 2005).

Rochester created a park next to the river and the North Main Street Bridge and has attractively restored a former mill next to the river for senior housing. Rochester is also planning a riverwalk in the downtown (PlanNH, 2004) to bring the river into the commercial and social life of the city center.

Objectives

The public perception goal seeks to establish the values (both economic and natural) of the Cocheco, educate the public about these values and to involve them in restoration through programs and demonstrations sites. The objectives are as follows:

Public Perception and Education Objectives

1. Improve public perception through increased access to the river for recreation and enjoyment.
2. Establish objective and subjective values for the river.
3. Use Rochester and Dover riverwalks to improve public perception of the river.
4. Work closely with regional, state, and national organizations and agencies on shared goals and objectives.
5. Encourage public participation in all aspects of river restoration activities.
6. Demonstrate that the river is a sum of all the large and small streams that feed into the Cocheco and that attention to all streams is important.
7. Conduct youth civic engagement activities focused on river restoration.

Proposed Actions

The actions developed by the restoration planning committee range from increasing and improving access points to the river, to starting a Cocheco Festival, to conducting an evaluation of the value of the river to the economy of the cities and towns that surround it. Thirteen action plans were developed to address the objectives listed above. Table 6 lists these actions and the detailed action plans are included in Appendix C.

Table 6
Matrix of Actions
Public Participation Goal
Cocheco River Restoration Project

Goal - Change the negative public perception of and behavior towards the Cocheco River so that the assets and benefits of the Cocehco River can be realized.

Public Perception Objectives

1. Improve public perception through increased access to the river for recreation and enjoyment
2. Establish objective and subjective values for the river.
3. Use Rochester and Dover riverwalks to improve public perception of the river in both urban and rural settings.
4. Work closely with regional, state, and national organizations and agencies on shared goals and objectives
5. Encourage public participation in all aspects of river restoration activities.
6. Demonstrate that the river is a sum of all the large and small streams that feed into the Cocheco and that attention to all these streams is important.
7. Conduct youth civic engagement activities focused on river restoration.

Action Number	Description	Area of Interest	Related Objective(s)	Lead Organization	Communities	Other	Near Term - 1 to 3 Years	Mid Term 4 to 5 years	Long Term 6 to 10 years
PPE-1	Increase the number of access points for boating and recreation	All subwatersheds	PP Objective 1	CRWC	Upper, Middle and Lower Cocheco	NHFG, NHCP, user groups	highest	high	priority
PPE-2	Establish an annual Cocheco River Festival day	Middle or Lower Cocheco	PP Objectives 1, 2, 3, & 5	CRWC, Chambers of Commerce, conservation commissions	Rochester or Dover location and all watershed communities Cons. conservation,	businesses, volunteers, participants, resource agencies. Organizations	highest - start small festival	highest - grow festival	high
PPE-3	Determine the economic benefit of an improved river corridor	All subwatersheds	PP Objective 2	CRWC	Farmington, Rochester, Dover Econ. Dev. Dept.	SRPC, UNH, Chamber of Commerce	high	high	
PPE-4	Determine the economic impact of making the River a NH River Protection and Management Program state designated river.	All subwatersheds	PP Objective 2	CRWC	Town planning and Conservation Commissions.	Chamber of Commerce, UNH, Land trusts			priority
PPE-5	Determine economic benefit of existing and potential sources of water supply along the Cocheco River	All subwatersheds	PP Objective 2	Farmington, Rochester, Dover	All Communities	NHDES, UNH,	highest		
PPE-6	Research stakeholder perception of the values of Cocheco River to help build greater stewardship of the river.	All subwatersheds	PP Objective 2	CRWC	Cons. Com., planners	UNH, other University.	high		
PPE-7	Conduct Cocheco River Photo Contest	All subwatersheds	PP Objectives 1, 2, & 5	CRWC		businesses, volunteers, participants	highest		

Table 6
Matrix of Actions
Public Participation Goal
Cocheco River Restoration Project

Action Number	Description	Area of Interest	Related Objective(s)	Lead Organization	Communities	Other	Near Term - 1 to 3 Years	Mid Term 4 to 5 years	Long Term 6 to 10 years
PPE-8	Provide promotional efforts at downtown riverwalks to educate public about the Cocheco River	All subwatersheds	PP Objective 3 & 6	CRWC	Farmington, Rochester, Dover	UNHCE, Businesses, volunteers	highest	highest	highest
PPE-9	Post Cocheco River and tributary signs at road crossings	All subwatersheds	PP Objectives 4 & 5	CRWC	Municipal Public works departments	New Hampshire DOT, NHDES		high	
PPE-10	Publicize findings and successes of the Cocheco River Restoration Program and regularly announce volunteer opportunities.	All subwatersheds	PP Objectives 1, 5, & 6	CRWC	Community and municipal newsletters	Media outlets, Cable channel	high	high	high
PPE-11	Work with other watershed non-governmental organizations (NGOs) on common goals.	All subwatersheds	PP Objective 4 & 6	CRWC		Moose Mt Regional Greenways, Strafford Rivers Conservancy, others	high	high	high
PPE-12	Engage youth in river restoration	All subwatersheds	PP Objective 5&7	CRWC	schools, after school programs	Gulf of Maine Institute, 4-H, youth groups	highest	highest	highest
PPE-13	Develop outreach materials describing Cocheco River Restoration and Monitoring	All subwatersheds	PP Objectives 1, 5, & 6	CRWC	Municipal website hosting and/or links	UNHCE, College interns, businesses, volunteers	highest	high	high

Water Quality Restoration Goal

Improve the water quality of the Cocheco River to meet New Hampshire Class B water quality standards by 2015.

Current Status of Cocheco River Water Quality

At the present time, many areas along the Cocheco River do not meet the Class B standards for water quality as defined by the State of New Hampshire. Class B waters meet the second highest water quality standard. When these standards are met the Cocheco will be considered acceptable for fishing, swimming, and other recreational activities, and suitable for water supply after adequate treatment (Env- Ws 1700 and RSA 485-A:8). Currently the levels of bacteria along certain segments of the Cocheco are considered unacceptable for primary contact recreation (primarily swimming) and in some areas even for secondary contact recreation (boating, fishing). Mercury levels detected in fish also cause fish consumption to be assessed as non-supporting according to state standards.

As reviewed in a previous section and described in the Cocheco EQR, bacteria, excess nutrients, depressed dissolved oxygen, metals and solid waste are impacting the quality of the water in the Cocheco River. Although many potential sources of pollution are suspected, these sources have not been conclusively identified. The modified monitoring plan will be an important first step in locating specific sources. Once identified the next step will be reducing or eliminating these sources of pollution. The actions described below will be employed to achieve the water quality goals and objectives.

Objectives

Water Quality Restoration Objectives

1. Determine and minimize causes of dissolved oxygen and temperature fluctuations within the Cocheco River.
2. Understand and eliminate impact of failed septic systems and other bacterial loading on the Cocheco River.
3. Determine and work to reduce sources of elevated nutrients (phosphorus and nitrate) through modification of the sampling program.
4. Understand and reduce negative impact of stormwater discharge on the Cocheco River.
5. Determine sources and impacts of metals contamination in the Cocheco River Watershed and work to minimize impacts.
6. Research impact of current and proposed stream flow withdrawals on Cocheco River water quality.
7. Determine impacts of current and former land use on Cocheco River water quality and work to reduce these impacts.
8. Complete water quality monitoring on all Cocheco River watershed assessment units.

The following table (Table 7) summarizes the water quality concerns by subwatershed, causes (where known) for these water quality impacts. The table also lists the objectives of the restoration and monitoring plan that relate to these water quality impairments. A more detailed description of water quality impacts is included in the Environmental Quality Report for the Cocheco River Watershed (Fargo & Truslow, 2005).

The water quality of the river is impacted by and impacts so many aspects of watershed health; it is difficult to apportion all relevant objectives and actions to one goal. The goals of Cocheco River restoration are interwoven by design. For instance, many of the Public Perception and Education goals will have a direct impact on water quality by involving the community in activities that will enhance their appreciation for the river. The Habitat Improvement objectives include improvement of the riparian buffer, for instance, which will positively impact water quality. The Development and Stormwater Impact objectives include reducing the volume and negative impact of stormwater runoff to the river to so that water quality can improve. In short, all positive changes effected by implementation of the plan will directly or indirectly improve conditions for water quality.

Table 7 – Summary of Cocheco River Water Quality Concerns

Upper Cocheco Subwatershed			
Goal	**Indicators**	**Causes or Source of Impact**	**Restoration Objectives**
Meet New Hampshire Class B water quality standards by 2015.	Low pH.	Low pH values caused by unknown source.	Determine and minimize causes of dissolved oxygen and temperature fluctuations within the Cocheco River.
	Presence of variable milfoil	Nonnative aquatic vegetation in Sunrise Lake. Suspect transient boater(s).	Determine the distribution of nuisance aquatic and terrestrial species to evaluate the present condition of Cocheco River habitat
	Bacteria concentrations	Failed septic systems	Understand and eliminate impact of failed septic systems and other bacterial loading on the Cocheco River.

Axe Handle Brook Subwatershed			
Goal	**Indicators**	**Causes or Source of Impact**	**Restoration Objectives**
Meet New Hampshire Class B water quality standards by 2015.	pH	Low pH values of caused by unknown source.	Determine and minimize causes of dissolved oxygen and temperature fluctuations within the Cocheco River.
	Bacteria concentrations	Runoff from livestock operations	Understand and eliminate impact of livestock operation on Axe Handle Brook.

Table 7 continued–
Summary of Cocheco River Water Quality Concerns

Middle Cocheco Subwatershed			
Goal	**Indicators**	**Causes or Source of Impact**	**Restoration Objectives**
Meet New Hampshire Class B water quality standards by 2015.	Phosphorus, pH and dissolved oxygen	Low pH and dissolved oxygen from landfill, treated sanitary wastewater effluent and septage lagoons.	Determine and minimize causes of dissolved oxygen and temperature fluctuations within the Cocheco River.
	Habitat and biological index measures	Degradation of instream habitat caused by poor riparian cover, bank instability and sedimentation	Identify sites along tributary streams and the River needing restoration, and restore and protect instream and riparian habitats and buffer areas.
	Variable milfoil	Nonnative aquatic vegetation in Cocheco River. Suspect transient boater(s).	Determine the distribution of nuisance aquatic and terrestrial species to evaluate the present condition of Cocheco River habitat.
	Bacteria concentrations	Elevated bacteria concentrations caused by failed septic systems	Understand and eliminate impact of failed septic systems and other bacterial loading on the Cocheco River.
		Elevated bacteria concentrations caused by illicit discharges & possibly cross connections.	Understand and eliminate impact of illicit discharges and other bacterial loading on the Cocheco River.
		Elevated bacteria caused by poor manure management practices.	Understand and eliminate impact of manure management on the Cocheco River.

Table 7 continued–
Water Quality Summary – Cocheco River Subwatersheds

Lower Isinglass Subwatershed			
Goal	**Indicators**	**Causes or Source of Impact**	**Restoration Objectives**
Meet New Hampshire Class B water quality standards by 2015.	Dissolved oxygen	Low dissolved oxygen values caused by municipal point source.	Determine and minimize causes of dissolved oxygen and temperature fluctuations within the Cocheco River.
	Bacteria concentrations	Unknown	Identify and eliminate sources of bacterial loading on the Lower Isinglass and Cocheco Rivers.

Lower Cocheco Subwatershed			
Goal	**Indicators**	**Causes or Source of Impact**	**Restoration Objectives**
Meet New Hampshire Class B water quality standards by 2015.	Dissolved oxygen	Low pH values caused by municipal point source.	Determine and work to reduce sources of elevated nutrients (phosphorus and nitrate) through modification of the sampling program.
	Bacteria concentrations	Elevated bacteria concentrations caused by illicit discharges & possible cross connections.	Understand and eliminate illicit discharges on the Cocheco River.
	Bacteria concentrations	Elevated bacteria concentrations caused by failed septic systems.	Understand and eliminate impact of failed septic systems and other bacterial loading on the Cocheco River.

Actions

Water Quality Restoration actions include modifying sampling programs to identify sources of dissolved oxygen impact, bacterial loading, increased metals, and nutrients that degrade aquatic and riparian habitats. Identification and correction of illicit discharges, failed septic systems and leaking or malfunctioning sanitary sewers are also included. Finally, cleanup of these sources and then monitoring the impacts of river restoration are part of the Water Quality Goal action plan. A total of 22 action plans were developed to address water quality concerns. The action plans are summarized in Table 8 and detailed action plans are found in Appendix C.

Table 8 -
Matrix of Actions
Water Quality Restoration Goal
Cocheco River Restoration Project

Goal - Improve the water quality of the Cocheco River to meet New Hampshire Class B water quality standards by 2015.

Water Quality Restoration Objectives

1. Determine and minimize causes of dissolved oxygen and temperatures fluctuations within the Cocheco River.
2. Understand and eliminate impact of failed septic systems and other bacterial loading on the Cocheco River.
3. Determine and work to reduce sources of elevated nutrients (phosphorus and nitrate) through modification of the sampling program.
4. Understand and reduce negative impact of stormwater discharge on the Cocheco River.
5. Determine sources and impacts of metals contamination in the Cocheco River Watershed and work to minimize impacts.
6. Research impact of current and proposed stream flow withdrawals on Cocheco River water quality.
7. Determine impacts of current and former land use on Cocheco River water quality and work to reduce these effects.
8. Complete water quality monitoring on all Cocheco River watershed assessment units.

Action Number	Description	Area of Interest	Related Objective(s)	Lead Organization	Communities	Other	Near Term - 1 to 3 Years	Mid Term 4 to 5 years	Long Term 6 to 10 years
WQR-1	Modify sampling plan to better define and understand causes of anamolous dissolved oxygen, biological oxygen demand, and temperature fluctuations in the Cocheco River Watershed	All Subwatersheds	WQR Objective 1	CRWC	All communities	VRAP, UNH, consultants, Waste Management, riparian landowners, volunteers	highest	highest	
WQR-2	Reduce sources of depressed dissolved oxygen, biological oxygen demand, and temperature fluctuations.	All subwatersheds	WQR Objective 1	NHDES, CRWC	All Communities	Residents, businesses. Industry		highest	highest
WQR-3	Modify bacterial sampling program to further identify sources of bacterial loading	Upper, Middle and Lower Cocheco	WQR Objective 2	CRWC		VRAP, UNH, consultants, volunteers	highest	highest	
WQR-4	Evaluate extent of failed septic systems in heavily settled areas.	Farmington, Rochester, Dover	WQR Objective 2	Farmington, Rochester, Dover	Farmington Health Officer, Public Works	Residents, NHDES	highest	highest	
WQR-5	Begin volunteer program to help identify illicit discharges.	Upper, Middle and Lower Cocheco	WQR Objective 2	CRWC	Public works departments	Volunteers, NHDES	high	high	
WQR-6	Evaluate and correct illicit discharges and cross connections near Cocheco River and its tributaries.	Upper, Middle and Lower Cocheco	WQR Objective 2	Public works departments	Farmington, Rochester, Dover	CRWC, NHDES, property owners		high	high
WQR-7	Support efforts to replace failed septic systems or extend town/city sewer services.	Upper, Middle and Lower Cocheco	WQR Objective 2	CRWC	Public works departments	NHEP, NHDES, Congressional delegates		highest	highest

Table 8 -
Matrix of Actions
Water Quality Restoration Goal
Cocheco River Restoration Project

Action Number	Description	Area of Interest	Related Objective(s)	Lead Organization	Communities	Other	Near Term - 1 to 3 Years	Mid Term 4 to 5 years	Long Term 6 to 10 years
WQR-8	Conduct water quality monitoring to verify water quality improvement in areas of septic system repair and illicit discharge corrections.	Upper, Middle and Lower Cocheco	WQR Objective 2	CRWC	Public works departments	VRAP, volunteers, NHDES		high	high
WQR-9	Review existing data to identify areas of elevated phosphorus and nitrogen and modify sampling plan to assess source areas.	Upper, Middle and Lower Cocheco	WQR Objective 3	CRWC	Municipalities	VRAP, UNH, consultants	highest		
WQR-10	Conduct a nutrient Total Maximum Daily Load allocation study above sampling point 12 CCH at Watson Road Bridge, Dover	Lower Cocheco	WQR Objectives 3 & 4	CRWC, NHDES	Rochester, Dover	UNH	highest		
WQR-11	Work with municipalities to rigorously apply use of Best Management Practices for nutrients.	All subwatersheds	WQR Objectives 3 & 4	CRWC	Land Use Boards, public works depts.	UNHCE, residents		high	high
WQR- 12	Analyze sampling data, identify existing impacts of stormwater runoff on Cocheco River water quality	All Subwatersheds	WQR Objective 4	CRWC	Public works departments	VRAP, volunteers, NHDES		high	
WQR-13	Educate municipalities and citizens about the impact of pet waste and yard waste on water quality and work to reduce sources.	All subwatersheds	WQR Objectives 2, 3 & 4	CRWC	All Municipalities	NHDES, SRPC, UNHCE	highest	highest	
WQR-14	Add regular metals analysis to sampling program to further define occurrence and sources of elevated metals	Middle and Lower Cocheco	WQR Objective 5	CRWC	Rochester and Farmington WWTP	VRAP, volunteers, NHDES	highest		
WQR-15	Research permitted withdrawals from the river	All subwatersheds	WQR Objective 6	CRWC	Public works departments, Cons. Commissions.	NHDES, consultants	priority		
WQR-16	Study Regional Options for Wastewater Discharge	NA	WQR Objectives 1, 2, 5 & 6	CRWC	Public works departments	UNH, Great Bay Estuary Commission, NHDES, NHCP	highest	highest	

Table 8 -
Matrix of Actions
Water Quality Restoration Goal
Cocheco River Restoration Project

Action Number	Description	Area of Interest	Related Objective(s)	Lead Organization	Communities	Other	Near Term - 1 to 3 Years	Mid Term 4 to 5 years	Long Term 6 to 10 years
WQR-17	Look at WWTP discharge options to determine how these plans will impact Cocheco River Water Quality.	Middle and Lower Cocheco and Isinglass	WQR Objectives 1, 2, 5 & 6	CRWC	Public works departments	UNH, NHDES	high	high	high
WQR-18	Review Wastewater Treatment Plant permits and assist in understanding overall impacts of discharge to the River.	Middle and Lower Cocheco	WQR Objectives 1, 3, 5 & 6	CRWC	NHTAG	NHDES, SRPC, CRWC	high	high	high
WQR-19	Modify sampling plan to track water quality changes in the vicinity of active and closed landfills along the Cocheco River.	Upper, Middle and Lower Cocheco	WQR Objective 7	CRWC	Public works departments	VRAP, UNH, consultants, landowners, NHTAG,NHDES Waste Management Division, EPA	highest	highest	highest
WQR-20	Track progress of evaluation and development of active and closed landfills in Farmington, Rochester and Dover.	Middle and Lower Cocheco	WQR Objective 7	CRWC	Public works departments	NHDES, consultants, NHTAG, EPA	highest	highest	highest
WQR-21	Work with City of Dover to track contaminant attenuation feasibility study at Tolend Road landfill in Dover.	Lower Cocheco	WQR Objective 7	CRWC	City of Dover	NHTAG, NHDES, EPA	highest	highest	highest
WQR-22	Complete TMDL for dissolved oxygen in the Cocheco River in Farmington and Rochester	Upper and Mid Cocheco	WQR Objective 1	NHDES	Farmington and Rochester	EPA, CRWC	high		
WQR-23	Complete water quality assessment on all assessment units within the watershed so that DES water quality attainment can be evaluated.	All Subwatersheds	WQR Objective 8	CRWC	All subwatershed communities	DES, VRAP	high	high	high

Habitat Improvement Goal

Understand and improve the instream and riparian habitat of the Cocheco River watershed to assure the ecological well being of the river.

Current Status of Cocheco River Habitat Quality

The habitat in much of the Upper Cocheco watershed is intact and healthy. In the Middle and Lower Cocheco, areas between the towns and cities and along tributary streams are in satisfactory condition. However, fragmentation of land brought about by development of backland areas and along pond, stream and river shorelines and its associated stormwater and septic load strongly effects the quality of the land and stream habitats.

On a local level, CRWC has begun conducting biological inventories and assessments along several sections of the main stem of the Cocheco River (Chase, personal communication, 2005). The New Hampshire Nature Conservancy has also just conducted a study of several areas of the Lower Cocheco including the Blackwater Brook (NHNHI, 2004). Local land conservation organizations and open space committees are also busy prioritizing lands for conservation and putting lands into permanent protection. Stewardship of these lands is improving and protecting the habitats within their boundaries.

On a more regional level, the New Hampshire Estuaries Project is funding a remote sensing study of buffers within the estuarine watersheds, including the Cocheco River (NHEP, 2005). This information will be helpful in assessing buffer conditions and areas for action. New Hampshire Fish and Game Department has also recently conducted mapping of all the lands of the state to determine habitat quality and protection priorities (NHFG, 2003). They will soon be releasing a comprehensive report on wildlife habitat that can be used to guide stewardship and land protection.

Objectives

Much can be done on a local level to study and understand, and then work to protect and improve both upland and instream habitats. The objectives and actions described below address the areas that participants in this planning effort believed needed the most attention to best protect critical natural resources.

Habitat Improvement Objectives

1. Conduct research on and conduct inventories of aquatic and terrestrial species and their habitat to evaluate the present condition of Cocheco River corridor.
2. Determine the distribution of nuisance aquatic and terrestrial species and habitat to evaluate the present condition of Cocheco River habitat.
3. Identify sites along tributary streams and the river needing restoration.
4. Restore and protect instream and riparian habitats and buffer areas.
5. Improve recreational value of river by increasing healthy fish populations.

Actions

The actions developed for Habitat Improvement include surveying the current habitat conditions, extent of nuisance and invasive species, research historic fish species, studying the impacts of dams and other obstructions to water flow, and improving the riparian corridor along the river. Twenty-three action plans were developed to improve instream and buffer habitat condition. These actions are listed in Table 9 and actions are described in Appendix C.

Table 9 - Matrix of Actions
Habitat and Wildlife Goal Restoration
Cocheco River Restoration Project

Goal - Understand and improve the instream and riparian habitat of the Cocheco River watershed to assure the ecological well being of the river.

Habitat Improvement Objectives

1. Conduct research on and conduct inventories of aquatic and terrestrial species and their habitat to evaluate the present condition of Cocheco River corridor.
2. Determine the distribution of nuisance aquatic and terrestrial species and habitat to evaluate the present condition of Cocheco River habitat.
3. Identify sites along tributary streams and the river needing restoration.
4. Restore and protect instream and riparian habitats and buffer areas.
5. Improve recreational value of the river by increasing healthy fish populations.

Action Number	Description	Area of Interest	Related Objective(s)	Lead Organization	Communities	Other	Near Term - 1 to 3 Years	Mid Term 4 to 5 years	Long Term 6 to 10 years
HI-1	Gather, analyze and report on completed habitat studies along the Cocheco River Corridor and tributaries	All subwatersheds	HI Objective 1	CRWC	All municipalities	Conservation Organizations, NHFG	high		
HI-2	Encourage communities to complete Natural Resource Inventories (NRI's) and water resource chapters for master plans	All subwatersheds	HI Objective 1	Planning Departments	Rochester Conservation Commission	Volunteers, NHFG, UNHCE, CRWC, SRPC	highest		
HI-3	Work with New Hampshire Natural Heritage Inventory to identify exemplary natural communities.	All subwatersheds	HI Objective 1	NH Audubon	Conservation Commissions	TNC, NHDES, CRWC	high	high	
HI-4	Review collected data and determine additional areas that need buffer and habitat surveys and complete surveys as needed.	All subwatersheds	HI Objective 1	CRWC	Conservation Commissions	Conservation organizations, UNHCE, UNH, NHNHI	highest	high	
HI-5	Research and report on impacts and benefits of gravel pits, agricultural land and other cultural open space in the riparian zone in the Cocheco River corridor	Upper and Middle and lower Cocheco	HI Objective 1	CRWC	Municipal Planning Departments	UNHCE,NHDES, UNH, SRPC, NHDept of Ag	high		
HI-6	Establish chemical, physical, and biological monitoring stations to determine links between biological and chemical changes along River	All subwatersheds	HI Objective 2	CRWC	Conservation Commissions	NHDES, NHCP	highest	highest	highest

Table 9 - Matrix of Actions
Habitat and Wildlife Goal Restoration
Cocheco River Restoration Project

Action Number	Description	Area of Interest	Related Objective(s)	Lead Organization	Communities	Other	Near Term - 1 to 3 Years	Mid Term 4 to 5 years	Long Term 6 to 10 years
HI-7	Survey distribution and determine causes of terrestrial and aquatic nuisance species.	All subwatersheds	HI Objective 2	CRWC	Conservation Commissions	Volunteers, NHFG, UNH, NHDES	highest	high	high
HI-8	Determine cost and impact of nuisance aquatic species such as variable milfoil on Cocheco River and habitat and water quality.	All subwatersheds	HI Objective 2	CRWC, NHDES	Conservation Commissions	Volunteers, NHFG, UNH		high	
HI-9	Educate public about cause and control of nuisance species.	All subwatersheds	HI Objective 2	CRWC	Municipalities	NHDES	highest	highest	highest
HI-10	Conduct a solid waste survey along the Cocheco River corridor and tributaries with the assistance of neighbors and volunteers	All subwatersheds	HI Objective 3	CRWC	Public Works departments	Volunteers, Residents, United Way	highest	high	high
HI-11	Survey road crossings to identify obstacles to stream flow and wildlife passage.	All subwatersheds	HI Objective 3	CRWC	Public works departments	NHDOT, UNH, NHFG, TNC	high		
HI-12	Understand the impact of dam operation and removal on Cocheco River instream and riparian habitat.	All subwatersheds	HI Objective 3 & 5	NHFG		Volunteers, NHFG, UNH, CRWC, RPC, DES River Restoration Program, NH DOT	highest	highest	highest
HI-13	Using collected riparian buffer data, determine priority buffer restoration areas.	All subwatersheds	HI Objective 1 & 4	CRWC	All municipalities	Conservation Organizations, NHDES, NHEP	high	high	high
HI-14	Restore gravel pits to protect corridor and to keep new gravel pit habitat intact for buffer integrity	Middle Cocheco, Lower Cocheco	HI Objective 4	Conservation Commissions	Farmington, Rochester, Dover	CRWC, NHDES, Conservation Organizations, businesses	high	high	high
HI-15	Establish additional osprey platforms along the river corridor.	Middle Cocheco, Lower Cocheco	HI Objective 4	NH Audubon	Conservation Commissions	CRWC, NHFG, UNHCE	highest		
HI-16	Organize and carry out periodic solid waste cleanups along the river and its tributaries with the help of neighbors and volunteers	All subwatersheds	HI Objective 4	CRWC	Public Works departments	Volunteers, Residents, United Way	highest	highest	highest

Table 9 - Matrix of Actions
Habitat and Wildlife Goal Restoration
Cocheco River Restoration Project

Action Number	Description	Area of Interest	Related Objective(s)	Lead Organization	Communities	Other	Near Term - 1 to 3 Years	Mid Term 4 to 5 years	Long Term 6 to 10 years
HI-17	Determine if Cocheco River is a 4th Order stream at Mad River in order to increase the protection of the river through the State of New Hampshire Shoreland Protection Act	Upper Cocheco	HI Objective 4	CRWC	Farmington	UNH, NHDES	highest		
HI-18	Determine optimal width of protection corridor on Cocheco River and tributaries to adequately protect wildlife and habitat	All subwatersheds	HI Objective 3	Land Protection Organizations, CRWC	All municipalities	NHDES, NH Audubon, TNC, UNH Cooperative Extension	highest	highest	
HI-19	Work to restore other areas identified for buffer and habitat restoration	All subwatersheds	HI Objective 4	CRWC	Conservation Commissions	NHEP, NHCP, NHFG, UNHCE	high	high	high
HI-20	Work with local land protection organizations to identify and protect priority lands for habitat and river corridor protection.	All subwatersheds	HI Objective 1 & 4	CRWC	Open Space Committees, Conservation Commissions	Conservation Organizations	high	high	high
HI-21	Research historic fish species and their distribution within the Cocheco River watershed.	All subwatersheds	HI Objective 5	NHFG		CRWC, TU, UNH	priority	priority	priority
HI-22	Study impact of shallow bedrock on riparian habitat at Whittier Falls in Dover	Lower Cocheco	HI Objective 4 & 5	NHFG	Conservation Commissions	CRWC	priority	priority	
HI-23	Work with NH Fish and Game and US Army Corps of Engineers to study and improve fish habitat in flood control project in Farmington.	Upper Cocheco	HI Objective 4 & 5	CRWC	Farmington	NHFG, USACoE	high	high	high
HI-24	Work with the City of Dover on the Berry Brook restoration project.	Lower Cocheco	HI Objective 4 & 5 DSI Objective 4 & 6	CRWC	Dover	NHFG, UNHCE, riparian landowners	highest	high	high
HI-25	Restore Willow (Wordley) Brook in Rochester to natural stream functions	Middle Cocheco	HI Objective 4 & 5 DSI Objective 4 & 6	CRWC	Rochester Public Works Dept., Cons. Comm.	NRCS	highest	highest	
HI-26	Work with the Town of Farmington to restore the Mad River at Tappan Street.	Upper Cocheco	HI Objective 4 & 5 DSI Objective 4 & 6	CRWC	Farmington	NHFG, UNHCE, riparian landowners, St.. Peter's Church, NRCS	highest	high	high

Development and Stormwater Impact Goal

Minimize the impact of current and future development on the Cocheco River and its tributaries.

Current Status of Development and Stormwater Impact Abatement

Land use boards, Strafford Regional Planning Commission and departments of public works in many of the towns and cities in the watershed are working to improve existing stormwater and development infrastructure and encourage development that protects streams and rivers. In some areas, old infrastructure is still impacting the Cocheco River negatively. Additionally current zoning ordinances and planning regulations in some municipalities do not adequately protect watershed functions.

Much effort will be made as part of this restoration effort to improve, recognize, and correct many of the existing impacts from point sources, landfills, and commercial and residential development and industrial activities. As part of this overall effort, CRWC and the planning participants also recognized the need to implement good planning techniques; install or retrofit infrastructure that will treat stormwater adequately; protect groundwater; and allow for healthy pond, wetland and stream buffers that will protect the quality of the Cocheco River.

Objectives

The following objectives and actions illustrate the primary concerns that affect the Cocheco.

Development and Stormwater Impact Goal Objectives

1. Improve planning design, and construction methods to reduce negative impacts on Cocheco River.
2. Improve enforcement of federal, state, and local regulations that improve or protect the quality of the Cocheco River.
3. Protect groundwater resources that provide public water supply and recharge tributaries and the Cocheco River.
4. Reduce stormwater runoff volume and improve treatment at existing and future stormwater structures.
5. Determine the impact of road crossing design and maintenance on the water quality of the river and tributary streams.
6. Educate the public about the benefits of a healthy riparian buffer through the use of demonstration sites and activities on the Cocheco River.
7. Study and eliminate obstacles to river flow and fish passage and wildlife travel at dams, bridges, culverts, and natural obstacles on main stem and tributaries to the Cocheco River.

Development and Stormwater Impact Goal	Indicators	Causes or Source of Impact	Restoration Objectives
Minimize the impact of current and future development on the Cocheco River and its tributaries.	Bacteria and phosphorus pollutant loads	Bacteria and phosphorus levels increasing as development increases.	Reduce stormwater runoff volume and improve treatment at existing and future stormwater structures.
	Sediment loads	Current stormwater treatment inadequate to protect water quality	Reduce stormwater runoff volume and improve treatment at existing and future stormwater structures.

Actions

The actions relative to Development and Stormwater Impact reduction that planning participants felt were important included: educating the public and municipal officials about stormwater and land use Best Management Practices (BMP's), developing a BMP manual for the Cocheco, evaluating road crossings for impediments to wildlife passage and negative stormwater impacts, passage of stronger stormwater management ordinances and regulations to lessen the impacts of impervious cover on the river, encouraging innovative stormwater treatment areas, and erecting a demonstration snow dump to reduce the impact of runoff to the Cocheco. Twenty-four action plans have been developed to address the development and stormwater impacts in the watershed. These actions are listed in Table 10 and are described in Appendix C.

Again, many of the objectives for the other three restoration goals also address lessening the impacts of development and stormwater runoff, through the actions developed for that goal. Ultimately, for the restoration to have a lasting impact, public perception of the river will need to be positively altered, habitats will need study, improvement, or restoration, and stormwater impacts will need to be reduced. Finally, water quality sampling will document if these changes improve the quality of water so that Class B water quality can be attained along each reach of the tributaries and main stem of the Cocheco River.

Table 10 -Matrix of Actions
Development and Stormwater Impact Goal
Cocheco River Restoration Project

Goal - Minimize the impact of stormwater and current and future development on the Cocheco River and its tributaries.

Development and Stormwater Impact Goal Objectives

1. Improve planning design, and construction methods to reduce negative impacts on Cocheco River.
2. Improve enforcement of federal, state, and local regulations that improve or protect the quality of the Cocheco River.
3. Protect groundwater resources that provide public water supply and recharge tributaries and the Cocheco River.
4. Reduce stormwater runoff volume and improve treatment at existing and future stormwater structures.
5. Determine the impact of road crossing design and maintenance on the water quality of the River and tributary streams.
6. Educate the public about the benefits of a healthy riparian buffer through the use of demonstration sites and activities on the Cocheco River.
7. Study and eliminate obstacles to river flow and fish passage and wildlife travel at dams, bridges, culverts, and natural obstacles on main stem and tributaries to the Coche

Action Number	Description	Area of Interest	Related Objective(s)	Lead Organization	Communities	Other	Near Term - 1 to 3 Years	Mid Term 4 to 5 years	Long Term 6 to 10 years
DSI-1	Reduce or minimize proliferation of impervious surfaces.	All subwatersheds	DSI Objectives 1 & 6	Municipalities	All Municipalities	NHDES, SRPC, NHEP, UNHCE, CRWC	highest	highest	highest
DSI-2	Promote minimum impact developments.	All subwatersheds	DSI Objectives 1, 2, & 6	Municipalities	All Municipalities	NHDES, SRPC, UNH, UNHCE, CRWC	highest	highest	highest
DSI-3	Erect a demonstration snow dump to reduce impact of this runoff to the Cocheco River.	Middle Cocheco	DSI Objectives 1 & 4	Rochester Public Works	Rochester	NHDES, NHDOT, CRWC	highest	highest	
DSI-4	Assist municipalities in carrying out stormwater management plans.	Upper, Middle and Lower Cocheco	DSI Objectives 1, 2, & 5	NHDES	Dover and Rochester Public works departments	UNHCE, Seacoast Stormwater Coalition. CRWC	highest	highest	highest
DSI-5	Develop Cocheco River Watershed Stormwater Best Management Practices Handbook	All subwatersheds	DSI Objectives 1, 4, & 6	CRWC	Public works departments, Cons. Commissions.	NHDES, NHEP, NHCP, UNHCE	highest	highest	highest
DSI-6	Educate public about stormwater Best Management Practices.	All subwatersheds	DSI Objective 4	CRWC, NHDES	Public works departments and Cons. Commissions.	UNHCE	high	high	high
DSI-7	Work with citizens and municipalities to reduce shoreline protection violations and stream bank modification	All subwatersheds	DSI Objectives 2 & 6	NHDES	Cons. Commissions., All communities	CRWC	high	high	high

Table 10 -Matrix of Actions
Development and Stormwater Impact Goal
Cocheco River Restoration Project

Action Number	Description	Area of Interest	Related Objective(s)	Lead Organization	Communities	Other	Near Term - 1 to 3 Years	Mid Term 4 to 5 years	Long Term 6 to 10 years
DSI-8	Work to make the Cocheco River a state designated river under the New Hampshire Rivers Management and Protection Program	All subwatersheds	DSI Objectives 6	CRWC	All Communities, Cons. Commissions.	NHDES			priority
DSI-9	Promote protection of groundwater resources in Cocheco Watershed	All subwatersheds	DSI Objectives 3 & 6	CRWC, land protection organizations	Public works departments	Conservation commissions, open space committees, NHDES	highest	highest	highest
DSI-10	Identify and correct flawed or outdated stormwater infrastructure along Cocheco River.	All subwatersheds	DSI Objectives 1, 4, & 6	Watershed Public Works Departments	primarily Rochester, Farmington, Dover	NHDES, NHDOT, CRWC	highest	highest	
DSI-11	Encourage and sponsor innovative stormwater treatment demonstration projects.	All subwatersheds	DSI Objectives 1, 4, 6	CRWC	Public works departments	UNH, NHDES, UNHCE, NRCS, NHDOT	highest	highest	highest
DSI-12	Evaluate road crossings and lessen stormwater impairment at these Cocheco River discharge points.	All subwatersheds	DSI Objectives 1,4,6	CRWC	Public works departments	NHDOT, UNH, NRCS	high	high	
DSI-13	Educate department of public works managers and road crews on impacts of road treatment and construction on river and tributaries in the watershed	All subwatersheds	DSI Objectives 1 & 6	UNH Stormwater Center	Public works departments	NHDOT, UNHCE, NHDES, CRWC	highest	highest	
DSI-14	Establish a riparian buffer demonstration site(s)	To be determined	DSI Objective 6	CRWC	Chosen municipality	Citizens, riparian landowners, volunteers	highest		
DSI-15	Prepare and provide citizen/municipal training programs at riparian demonstration sites	Upper, Middle and Lower Cocheco	DSI Objective 6	CRWC, NHDES	All Communities	Volunteers, Residents, riparian landowners	highest	highest	highest
DSI-16	Work with Municipalities to implement Best Management Practices along riparian corridors.	All subwatersheds	DSI Objective 1 & 6	CRWC, NHDES	Public works departments	Citizens,		high	

Table 10 -Matrix of Actions
Development and Stormwater Impact Goal
Cocheco River Restoration Project

Action Number	Description	Area of Interest	Related Objective(s)	Lead Organization	Communities	Other	Near Term - 1 to 3 Years	Mid Term 4 to 5 years	Long Term 6 to 10 years
DSI-17	Educate citizens, riparian landowners and municipalities about the value of riparian buffers and best management practices for streamside use.	All subwatersheds	DSI Objective 6	CRWC	Public works departments	NH Audubon, Cooperative Extension, NHDES	highest	highest	highest
DSI-18	Correct erosion at Cocheco Rd. Bridge Crossing of Cocheco, Farmington & restore the canoe landing	Upper Cocheco	DSI Objective 1 PPE Objective 1	CRWC	Town of Farmington	Boy Scouts, NRCS	highest		
DSI-19	Improve stormwater drainage from River Street in Rochester at City Dam	Middle Cocheco	DSI Objectives 1 & 4	City of Rochester.	Rochester Public Works Dept.	NRCS	highest		
DSI-20	Improve stormwater drainage at Catherine Street, Rochester	Middle Cocheco	DSI Objectives 1 & 4	City of Roch.	Rochester Public Works Dept.	NRCS	highest		
DSI -21	Restore sewer easement crossing of Hurd Brook	Middle Cocheco	DSI Objective 5 PPE Objective 7	CRWC	Rochester Public Works Dept.	NRCS	highest		
DSI-22	Establish sand removal management from bridges in Farmington at Cocheco Road , old Bridge by RT 11 on Mad River and River Street Bridge on Mad River	Upper Cocheco	DSI Objective 4	Town of Farmington	Farmington Public Works Dept.		highest		
DSI-23	Remove accumulation of yard waste at Dewey Street footbridge and restore river bank, Rochester	Middle Cocheco	DSI Objectives 2 & 6		Rochester Public Works Dept. Cons. Comm.	NRCS	highest		
DSI-24	Develop and implement municipal stormwater ordinances and regulations that protect the river and its tributaries from additional pollutant loads and degradation.	All subwatersheds	DSI Objectives 1 & 4	Municipalities	Land Use Boards	SRPC, DES, UNH Stormwater Center	highest	high	high

Section 7 - Restoration Implementation

The success of this restoration plan will be based on the acceptance, endorsement, and commitment of the citizens and leaders in watershed communities to implement the actions. The CRWC has spearheaded river stewardship since 1998, initiated this study, and will continue to provide the advocacy required to make Cocheco River restoration a success.

Introduction

The restoration planning committee identified over eighty actions to achieve the four goals with their supporting objectives. These detailed action plans are included in Appendix C. After this lengthy planning process, CRWC members also developed a plan for implementation of the Cocheco River watershed restoration. It is presented below.

> *A coalition is defined as: Individuals or organizations working together in a common effort for a common purpose to make more effective and efficient uses of resources.*

Up to the present, the CRWC provided leadership, spearheaded river stewardship and raised awareness of environmental quality throughout the watershed communities. Many people and organizations supported the CRWC programs. In fact, the choice to name the organization a coalition was made with the foresight that many partnerships would be necessary to accomplish our mutual goals. CRWC has worked well with partners – communities, municipalities, other organizations, state and federal agencies and individuals – to accomplish the work done so far. Still others have worked independently for years, actively restoring the river, and we salute their efforts.

The restoration plan includes a broad spectrum of proposed actions. Some actions will require a large amount of coordination and resources and others will be simple to plan and execute. Some of the proposed actions are already underway and some will take place several years into the future. Some actions will require many hours of volunteer time and others will require large capital outlays and professional expertise. Some actions are broadly stated and others are well defined and site specific.

Completion of the action plans will require participation of many professionals and volunteers, interest groups, municipal staff and officials, businesses, and government agencies. It is the intent of the CRWC that others will implement many of the actions, independently or in partnership with CRWC. Some actions can be accomplished in a cooperative effort and the CRWC can provide coordination and networking support. Reaching out to residents and users of the watershed – to recruit participation, to build widespread knowledge and develop new attitudes and behaviors – is an important component of the plan as is celebration of completion and success.

Most importantly, the plan is a fluid document. As preliminary actions are completed and more is known about watershed conditions, the plan will be reviewed and modified accordingly.

The Cocheco River Watershed Coalition Structure

Governance The present structure of the CRWC was chosen in the organization's infancy. As currently structured, officers and a small executive committee operate under bylaws written at our founding. The goals then established continue to guide the activities of the CRWC and are compatible with the goals of the *Watershed Restoration and Implementation Plan for the Cocheco River*. The capacity of the CRWC in its present structure, however, is insufficient for the ambitious new objectives and actions set forth in this plan. Changes to the governing structure of the CRWC are needed in order to implement the actions in the restoration plan. Grant funding has paid for coordination of grant project-related activity, but tasks related to management of the organization have required many volunteer hours. As grant funded activities grow in number and complexity, there is growing need for supplemental management of the organizational functions of the CRWC.

The CRWC governing body will continue to be responsible for maintaining the organization, drawing resources to the activities of the organization, representing the organization to others, and planning and oversight of the activities of the organization. A preliminary self-assessment of the CRWC identified the following needed changes:

1. Strengthen governance, perhaps in the form of a Board of Directors with rotating terms to replace the Executive Committee, and increase the number of directors.
2. Encourage official representation from all watershed communities and other interest groups.
3. Establish standing committees with specified tasks and responsibilities.
4. Apply for and maintain IRS 501 (c)(3) status for fundraising.
5. Improve fiscal planning and accountability.
6. Foster better communication with partners.
7. Expand the organization's membership base.
8. Secure support for maintaining tasks such as newsletters and record keeping.
9. Secure funding for liability insurance renewal.
10. Establish regularly scheduled meetings for the governing body.

Resources needed to accomplish the changes listed above vary from technical expertise for filing the IRS forms, professional advice, improved media presentation of the CRWC plans and accomplishments and funding. The restoration actions can be effectively carried out with an expanded organizational capacity and additional funding and expertise.

A Private/ Public model. The CRWC currently operates in a private/public model. A professional project coordinator is housed at the Strafford County UNH Cooperative Extension (UNH-SCCE) office at the Strafford County Complex in Dover. UNH-SCCE staff participates in educational programming for the CRWC and provides office space and limited office staff support for the Coordinator at no cost to the CRWC. No salary is provided to the Coordinator by UNH-SCCE. All salary funds are garnered through competitive grant funds that are applied for through the CRWC and written by the Project Coordinator.

The CRWC goals and objectives mesh well with those of UNH-SCCE and the benefits of the collaboration have been reciprocal. The arrangement has been secured by mutual agreement on an informal basis and the relationship with a Watershed Coordinator is expected to continue in that manner.

The activities of the CRWC have been supported, in large part, with technical assistance and funding from state and federal agencies. The DES, the NH Coastal Program, and NH Estuaries Project have supported the CRWC since its inception. At the federal level, both USEPA and NOAA have funded our activities. USDA, through the Natural Resources Conservation Service (NRCS) is currently supporting restoration activities and the US Department of the Interior (USDI) Land and Water Conservation Fund (LWCF) is funding a conservation and recreation project in the watershed. Municipalities have generously contributed in-kind services or completed projects within municipal budgets, and have applied for and been awarded various grants to conduct remediation work. River restoration has and will continue to have direct public benefit and should continue to be supported through these programs. Partnerships with the public sector will be an important component of implementation of the plan.

From the private sector, volunteers have contributed hundreds of hours of planning, monitoring, cleanups, stream assessments and education. While contributions from the business and industrial sector have been generously given, full partnership needs still to be developed as a source of support for restoration.

Recommended Structure for Watershed Restoration Implementation

The current Executive Committee structure will shift to a larger Board of Directors structure. Current committee members and officers will re-write the bylaws to accommodate a new and expanded structure in an effort to widen the geographical participation (representatives from all watershed towns) and include various interests such as land use planners, land protection advocates and wildlife stewards. The revised bylaws will also include provisions for hiring and managing staff and administering funds. The bylaws need to reflect an expanded capacity for the CRWC and the potentially greater responsibilities of the Directors and Officers.

Cocheco River Watershed Coalition Board of Directors

The Board of Directors will have a minimum of 12 directors and a maximum of 15 directors. Representatives from each community in the five subwatersheds represented in this Plan are required and representatives from the other subwatershed towns are strongly encouraged to serve on the Board. This means that representatives from New Durham, Middleton, Milton, Farmington, Rochester, Dover, and Somersworth are required. Other board representation must include the business community, the media, and a regional planning entity.

Bylaws will be revised and approved by the Executive Committee by (May 31, 2006). The new Board of Directors will meet by (July 31, 2006).

As part of the planning process, CRWC determined that a Watershed Coordinator (Coordinator) will be needed to implement the plan and that the Coordinator will be guided by a CRWC Board of Directors. In order to support the Coordinator's capacity to accomplish implementation, a part-time administrative assistant and bookkeeper will also be hired. It was further determined that a Restoration Technical Advisory Committee (RTAC), described below, will work with the Coordinator implement actions. RTAC members will work within their own organizations/resources/constituencies to advocate for and provide assistance for completion of Cocheco River restoration actions.

The Board will develop policies, hire the Coordinator, review the work of the Coordinator, and set and revise priorities as needed. The CRWC Board will serve as the fiscal agent for the program funds and will oversee the activities of the Coordinator and RTAC. A member of the Board will be a liaison between the Board and the RTAC and will attend all RTAC meetings.

Cocheco River Watershed Coordinator

The Coordinator will be a part time employee of the Cocheco River Watershed Coalition. The Coordinator will be housed at the Strafford County UNH Cooperative Extension office at the Strafford County Complex at their discretion. The position will be renewed on a two-year basis as long as funding is available. The Coordinator will spend approximately 20 hours per week working on the Cocheco River restoration program. Funding for the Coordinator position will be for implementation of the actions and organization tasks directly related to restoration implementation and monitoring activities. The CRWC Board may also choose to utilize the Coordinator for other activities at the additional expense of that organization. An understanding about the role of the Board Chair in direction and supervision of the Coordinator will be established prior to hiring the Coordinator for the position. The role of the Board will be established in the revised bylaws. The hiring committee will consist of two CRWC Board members, one DES staff person, and one UNH-SCCE staff person.

Responsibilities/Job Description: The Cocheco Watershed Coordinator will implement the Watershed Restoration/Implementation and Monitoring Plans with technical assistance from the RTAC and guidance from the Board of Directors. In particular, the Coordinator will carry out the following duties:

1. Work to carry out the mission of the CRWC and develop long term financial and community support for restoration and monitoring activities,
2. Implement the restoration actions and monitoring activities,
3. Promote environmental stewardship within the watershed to the residential and business community; and
4. Report regularly to the community and the Board on the progress of the restoration program.

Required Skills: The Coordinator will have a master's degree in environmental science, biological science, environmental engineering, natural resources, natural resource administration and/or management, community development or related field with a minimum of five years of experience in environmental work. The Coordinator will possess excellent project management and public speaking skills, and will be able to work effectively with both individuals and groups. Grant writing skills will also be necessary. The Coordinator will have computer skills necessary for the work to be performed. Strong attention to detail and the ability to maintain organized and accurate records is required. The Coordinator should be able to take on a broad range of responsibilities in the office and field. Familiarity with the local landscape and regulatory environment will be important. Media relations experience is also necessary.

Work Tasks For the first two years, the Coordinator will build working partnerships, oversee the environmental monitoring activities, implement outreach and education programs, coordinate implementation of actions designated as the near term and highest priority, and plan for years three and four of restoration. The tasks to be completed over the first two years include:

1. Establish the Restoration Technical Advisory Committee (RTAC) with the assistance of the CRWC Board and DES staff.
2. Work with the Board of Directors to establish a strategic plan for long-term administrative and financial support for the restoration, implementation and monitoring activities.
3. Establish or reconfirm partnerships with watershed stakeholders to promote awareness of the Cocheco River, generate matching funds and services for actions, and recruit volunteers to assist with project activities.
4. Conduct administrative tasks, including project budgeting, accurate record keeping, writing project reports and researching and writing grants to secure near term and long-term funding.
5. Conduct outreach and education efforts to promote awareness of the river, including conducting public programs, attending meetings, working with the media, and developing outreach materials.
6. Implement monitoring activities, including recruiting and working with volunteers to collect stream samples and perform field testing, and otherwise implementing the monitoring plan, as well as creating a method for tracking and reporting on progress and communicating environmental changes to the community and interested stakeholders.
7. Implement near term action plans.

Administrative Support

Part time administrative support for the restoration program will be needed in order for the Coordinator to effectively carry out implementation of the plan. A bookkeeper will be subcontracted to create and maintain financial records, work the Board and Coordinator to track budget status and develop financial reports. The Board may also subcontract for part-time clerical assistance for communications, taking and preparing meeting minutes, and other administrative tasks as suggested by the Coordinator or Board. The Board will be responsible for setting policy and contracting with the administrative staff.

Restoration Technical Advisory Committee

Responsibilities: The RTAC will provide technical assistance to the Coordinator and will suggest funding opportunities for restoration implementation. RTAC members will also serve on sub-committees as needed to guide the restoration program.

The CRWC will serve as the fiscal agent for the program funds and the CRWC Board will oversee the activities of the Coordinator and RTAC.

Implementation of some restoration actions may be passed from RTAC to CRWC standing committees by mutual consent and approval of the Board. For instance development of river access may be referred to the Trails and Access Committee and the Membership Committee may manage solicitation for volunteers.

Representation: The RTAC will be made up of official representatives of both cities in the watershed, Dover and Rochester. Official representatives will also be sought from two smaller towns in the watershed at a minimum, from DES, and other state and federal government agencies. In addition, representatives from a county or regional UNH Cooperative Extension or UNH representative, local non-profits, business and industry, and other citizen and technical advisors will be sought as appropriate. The size of the RTAC will be between seven and thirteen members.

Selection and service: The CRWC Board of Directors, DES and the Coordinator will invite the founding RTAC members. Its members will serve for the first three years of the restoration implementation. They will be chosen specifically to assist with those actions prioritized and scheduled for the near term. As actions are completed and as technical assistance needs evolve over time, RTAC membership will change appropriately. After the first advisory committee is established, the CRWC Board will approve, by majority, additional members as needed.

Partnerships

Implementation of the action plans in the *Watershed Restoration and Implementation Plan for the Cocheco River* will be accomplished through cooperative efforts of the Board, the Coordinator and the RTAC. The RTAC will include broad stakeholder and agency representation, however cooperation with other organizations and agencies

outside the RTAC will be essential to successful implementation. These groups may provide funding and technical assistance and will offer credibility to the program through their participation. Therefore, a great deal of emphasis will be placed on forming and maintaining partnerships with these groups and individuals. The Coordinator will have primary responsibility for developing and maintaining these partnerships.

Identifying partners Once the RTAC is established and the Coordinator is in place, they will work to identify project partners and their roles. These partners will be contacted and a summary of restoration actions and their potential role in the project will be provided for them. Regular communication with those partners will be maintained and brought into the restoration process as appropriate.

Primary Partners

Primary partners are those who have an integral role in the completion of restoration activities. Many of these partners have already participated in activities of the CRWC and the restoration planning process. The primary partners for implementing restoration are the residents and business leaders of the watershed, CRWC, Town of Farmington, City of Rochester, City of Dover, UNH-SCCE, DES, NHCP, UNH, NRCS, GoMI. The USEPA is a key partner and contributed to the planning process through technical and financial assistance. NOAA is also a key partner in the technical and financial support of CRWC water monitoring activities through the NHCP. Other primary partners may be added during the course of restoration. The role of some primary partners is described below.

Residents Residents of the Cocheco River watershed will serve as volunteers in water quality monitoring and other activities and will attend educational presentations. They will also be involved in educating neighbors and community officials on the importance of the Cocheco River.

Businesses Business leaders in the watershed will provide opportunities for employees to volunteer for Cocheco River activities such as water monitoring and surveys. They will also contribute through professional services and in-kind and cash donations.

Cocheco River Watershed Coalition CRWC will provide the administrative framework and management for the Coordinator and the RTAC. CRWC will be responsible for grant administration and progress reporting throughout the first two years of the implementation plan. They will also provide assistance to the Coordinator and RTAC as needed on outreach and education activities.

Strafford County UNH Cooperative Extension UNH-SCCE will provide office space and staff support for the Coordinator. Educators and specialists will provide educational programming and serve as a link to the resources of the University of New Hampshire.

University of New Hampshire Professors, researchers and students of UNH will provide technical assistance on water quality and natural resource issues, and restoration techniques.

Watershed Communities The City of Rochester will continue its partnership with the CRWC. The Public Works Department has secured funding for implementation of restoration activities for the river and tributary streams flowing through the City. The Public Works Department will continue to provide bacteria testing in its WWTP laboratory and to support river cleanup activities. The planning and economic development department and the conservation commission and the River Walk Committee are also contributing to river restoration efforts.

The City of Dover continues to work on river restoration through its planning, conservation commission, open space, waterfront and environmental services departments and committees. Stormwater structure and treatment improvements are both in progress and proposed. The City of Dover is a primary partner in the Targeted Watershed Grant proposal being developed for certain actions.

The Town of Farmington is actively seeking solutions to environmental problems and preparing for anticipated population growth. Current partnerships between the Town of Farmington and CRWC include the restoration of the Mad River and access to the river for recreational use and monitoring.

New Hampshire Coastal Program NHCP will provide guidance and information for restoration and outreach activities. They may also provide technical support for the monitoring program and opportunities for funding.

USDA-Natural Resources Conservation Service NRCS will provide technical assistance, oversight and financial support to restoration activities in Rochester using the Wildlife Habitat Incentives Program (WHIP). They will provide oversight to the Mad River stormwater project in Farmington and technical assistance to the Strafford County Complex trail and tree house project in Dover.

Gulf of Maine Institute GOMI will provide guidance to youth participation in restoration activities and offer opportunities for participation of watershed youth in GOMI regional and international activities.

New Hampshire Department of Environmental Services DES will provide technical assistance for watershed management, water quality monitoring, and other surveys. They will also continue to provide financial support through USEPA programs for restoration activities.

Secondary Partners

Secondary partner organizations and agencies will be identified by the Coordinator and CRWC and brought onto the committee as needed. Some of these partners may assume Primary Partner role as work proceeds. Some secondary partners could include the Isinglass River Local Advisory Committee, NH Fish and Game Department, New Hampshire Estuaries Project, Strafford Rivers Conservancy, Moose Mountain Regional Greenways, smaller watershed communities, NH Technical Assistance Group (EPA TAG group), and business organizations.

Public Participation

Information and education activities are a primary component of implementation. The Coordinator will partner with other organizations such as Great Bay Coast Watch, Strafford Rivers Conservancy, Moose Mountain Regional Greenways and service clubs, newspapers and cable television. The primary messages for the first two years of implementation include the promotion and celebration of the river and its resources as a community asset, the benefits of using individual and community best management practices, benefits of minimizing stormwater impacts and how citizens can make a difference through involvement in streamside cleanups and water quality monitoring.

Restoration goals and current projects will be promoted through newsletter articles, press releases, presentations, displays, brochures, and a Cocheco River Restoration website. The methods for involving the community and conveying these messages include participation in the following:

- Water quality monitoring, bio-monitoring, trash surveys and cleanups
- Photo contests
- River fest activities
- Canoe trips and other outings
- Developing access points to the river and streams
- Youth GOMI Teams in watershed communities

Implementing the Restoration and Monitoring Plans

As part of the CRWC planning process, participants ranked the restoration actions in preparation for implementation of these actions. The ranked action plans and the monitoring plan will help guide the work of the Coordinator and the RTAC. The ranked actions are included on Tables 6, 8, 9 & 10. These tables include the name and number of each action, the priority ranking (Highest, High, and Priority), and the timeframe for completion (near-, mid- and long-term) and the type of action (regulatory, research, infrastructure, and voluntary). The action plans are described in a summarized fashion in the tables. The detailed action plans are included in Appendix C.

The RTAC will have three levels and schedules for planning – a two year strategic planning cycle, an annual work plan/success measurement cycle and a quarterly review cycle. Each planning review cycle is described below.

Two year Strategic Planning

The initial meeting between the Board and the Coordinator will be spent developing a two-year strategic plan based on the prioritized actions and the goals of the monitoring plan. Overall, a three-year schedule for strategic planning is proposed to correspond with the priority rankings developed by the CRWC for restoration. Near-term, mid-term and long-term were assumed to be in three-year increments. This strategic plan will be revisited and revised every two years.

Annual Work Plan Development

The Coordinator will prepare annual work plans based on the prioritized actions and the monitoring plan activities. The work plan will be reviewed, modified as needed, and then approved by the CRWC Board.

The annual work plan describes the actions to be funded and implemented for the year, the tasks involved in implementing those actions, the schedule for implementing the tasks and the source of funding for implementation for each action. The detailed action plans included will be used as a guide for developing work tasks.

Tracking System and Reviews The Board will meet quarterly to review progress of the annual work plan. The Coordinator will work with the Board to develop a tracking system for the reviews and update the tracking program in preparation for quarterly meetings. The Board will have final responsibility for ensuring that action plans are implemented properly and according to the long-range schedule.

Action Plan Implementation The detailed action plans provide a framework for implementation and provide the suggested involvement level of the various stakeholders (regulatory, research, infrastructure and voluntary).

During the last stages of the restoration planning process, CRWC ranked the actions into Highest, High, and Priority levels as shown in Tables 6, 8, 9 & 10. During the course of implementation, the highest priority actions will take precedence. However, if an opportunity exists for implementing a lower priority action, the merits of implementation will be judged and included if the Board agrees.

Tasks to be completed – Years One and Two Implementation of years one and two actions will include a mix of ongoing activities, actions coordinated by the CRWC that are already underway, actions already being implemented by partners, and new actions. These actions are listed in Tables 11a and 11b.

There are several ongoing actions in watershed communities. The City of Rochester is implementing an eight-year project funded by NRCS, which meets CRWC objectives. CRWC may have a role in the project depending on the tasks proposed from year to year. The City of Dover is developing a restoration project on Berry Brook. This project meets Cocheco River restoration objectives and has high potential for CRWC involvement. Additionally, a cooperative stormwater management project in Farmington is being coordinated by CRWC with DES funding.

Water quality monitoring funds have been applied for through NHCP. CRWC is also working with the UNH Stormwater Center Staff on a USEPA Targeted Watershed Grant project. Several other projects with this group are also anticipated. These efforts will need ongoing support from the Watershed Coordinator as they proceed.

Tables 11a and 11b present the tasks proposed and the proposed budgets and the amount of professional coordination necessary to implement years one and two of the restoration plan.

Table 11a - Cocheco River Watershed Restoration Plan
Year One Tasks

Action #	Project Description	Organizations or communities involved in the Task	Funding committed?	Grant Funds	Match	Total Cost	Other resources needed
LWCF funded							
PPE-1	Cocheco Trail and Tree House	Strafford County	Yes	$ 100,000.00	$ 100,000.00	$ 200,000.00	LCWF,UNH-SCCE, SNHRCD
DES Grant Request							
PPE-2	Conduct River Fest	CRWC	No	$ 3,000.00	$ 3,000.00	$ 6,000.00	communities, volunteers, business
PPE-7	Conduct Photo Contest	CRWC	No	$ 300.00	$ 300.00	$ 600.00	Venue, sponsors, prizes, volunteers
WQR-13	Plan then educate about Pet/Yard waste	CRWC, NHCP, municipalities		$ 500.00	$ 500.00	$ 1,000.00	Volunteers
DSI-2	Educate about minimum impact developments	CRWC, SRPC		$ 250.00	$ 250.00	$ 500.00	Volunteers
DSI-10	Survey and correct flawed stormwater infrastructure	CRWC, UNH Stormwater Center		$ 3,000.00	$ 3,000.00	$ 6,000.00	Volunteers
DSI-5	Educate about BMPs	CRWC		$ 500.00	$ 500.00	$ 1,000.00	Volunteers
HI-2	Collect NRI's	CRWC					Volunteer, NROC, community officials
WQR-16	Regional wastewater, track and participate	CRWC, Municipalities, Public					Volunteers
HI-12	Track Gonic dam removal	CRWC					Volunteers
HI-15	Erect Osprey platforms	CRWC					Ext., Thompson School, ASNH, PSNH
HI-17	Investigate fourth order stream possibility	CRWC, NHDES					Volunteers

Table 11a - Cocheco River Watershed Restoration Plan
Year One Tasks

Action #	Project Description	Organizations or communities involved in the Task	Funding committed?	Grant Funds	Match	Total Cost	Other resources needed
PPE-12	Youth education	4-H, GOMI, CRWC, UNH-SCCE		$ 4,000.00	$ 4,000.00	$ 8,000.00	CRWC, GOMI Guide Team, Communities
NHCP Grant Request							
WQR-1	DO, pH, BOD Monitoring	CRWC,NHCP, NHDES, Roch. WWTF, NHEP	Applied for	$ 11,250.00	$ 11,250.00	$ 22,500.00	VRAP
WQR-3	Bacterial Monitoring	CRWC				Part of WQR-1 total	VRAP
WQR-9	Nutrient monitoring	CRWC, NHCP, NHDES				Part of WQR-1 total	VRAP
WQR-14	Metals monitoring	CRWC, DES,NHCP				Part of WQR-1 total	VRAP
WQR-23	Monitor all Aus	CRWC, DES,NHCP				Part of WQR-1 total	
HI-6	Biomonitoring	CRWC, NHCP, NHDES				Part of WQR-1 total	VBAP
Town of Farmington Projects							
WQR-4	Survey failed septic systems	Farmington, NHDES	Applied for				
DSI-18	Restore river bank and canoe landing dump road	Town of Farmington, NRCS					Volunteers, DPW, Scouts, CRWC
HI-26	Farmington habitat and stormwater restoration	CRWC, Town of Farmington, St. Peters Church, NRCS, NHDES	Yes	$ 17,700.00	$ 11,800.00		Volunteers. Contributions
DSI-22	Sand removal from bridges	Town of Farmington, NHDES					Town budget
NHTAG Funding							
WQR-20	Track landfill closure and cleanups	NHTAG					Volunteers

Table 11a - Cocheco River Watershed Restoration Plan
Year One Tasks

Action #	Project Description	Organizations or communities involved in the Task	Funding committed?	Grant Funds	Match	Total Cost	Other resources needed
WQR-21	Track Tolend Landfill cleanup	NHTAG	Yes	$ 20,000.00	$ 20,000.00	$ 40,000.00	Volunteers, EPA, Dover,consultants
City of Rochester Projects							
HI-7	Survey nuisance species & remove	Rochester DPW	Yes	$ 1,500.00	$ 500.00	$ 2,000.00	NRCS, Weedwatchers
HI-13	Buffer restoration	Rochester DPW	Yes	$ 4,650.00	$ 1,550.00	$ 6,200.00	NRCS
DSI-4	Work with City with stormwater management	Rochester DPW	Yes	$ 18,750.00	$ 6,750.00	$ 25,000.00	NRCS
HI-10	Solid waste survey	Rochester DPW	Yes			Part of DSI-4 total	NRCS
HI-11	Remove obstacles to flow, Wyandotte Falls to Rt.125	Rochester DPW	Yes			Part of DSI-4 total	NRCS
DSI-23	Restore Dewey St riverbank	Rochester DPW	Yes			Part of DSI-4 total	NRCS
DSI-21	Restore Hurd Brook crossing	Rochester DPW	Yes			Part of DSI-4 total	NRCS
HI-16	Riverside trash cleanup	Rochester DPW	Yes			Part of DSI-4 total	NRCS
DSI-20	Catherine St. stormwater structure improvement	Rochester DPW	Yes	$ 75,000.00	$ 25,000.00	$ 100,000.00	NRCS
DSI-19	River St. drainage improvement	Rochester DPW	yes				City budget
PPE-8	River Walk Education	Rochester	Yes			$ 50,000.00	RW Committee
Other Funding Sources							
DSI-1	Impervious surface education	CRWC, UNH Stormwater Center					Volunteers
DSI-25	Berry Brook restoration	Dover Planning Department, CRWC	yes			$ 150,000.00	City budget

Table 11b - Cocheco River Watershed Restoration Plan
Year Two Tasks

Action #	Action/project	Organizations or Communities Involved in the Task	Funding Committed ?	Grant funding	Match	Total cost	Other resources needed
LWCF funded							
PPE-1	Canoe landing on riverwalk	Rochester	No				Volunteers, design, materials
DES Grant Request							
PPE-2	River Fest expanded	CRWC	No	$ 2,000.00	$ 4,000.00	$ 6,000.00	volunteers, communities, donations
PPE-7	Photo Contest continued		No	$ 200.00	$ 400.00	$ 600.00	volunteers, sponsors, prizes, venue
WQR-13	Pet/yard waste ativities continued	CRWC, communities	No	$ 500.00	$500	$ 1,000.00	Volunteers
DSI-5	Develop BMP handbook and publish	CRWC, UNH Stormwater Center	No	$ 3,000.00	$ 3,000.00	$ 6,000.00	Seek funding for publication
HI-17	4th order stream if appropriate	CRWC, NHDES	No				volunteers
HI-4	Planning of buffer/habitat surveys	CRWC	No				EXT, NHFG, volunteers
WQR-4	Failed septic systems in other areas	Watershed Communities	No				Volunteers, comunities, GBCW, NHDES
PPE-12	GoMI, youth civic engagement	CRWC	No	$ 3,000.00	$ 3,000.00	$ 6,000.00	GoMI Guide team
Monitoring Grant Request							
WQR-1	DO, pH, BOD, continued from Year One, data analysis, reporting	CRWC	No	$ 11,250.00	$ 11,250.00	$ 22,500.00	NHDES, NHCP, volunteers
WQR-3	Monitor bacteria, new areas	CRWC	No			Part of WQR-1 total	NHDES, NHCP, volunteers
WQR-9	Monitoring nutrients analysis, report	CRWC	No			Part of WQR-1 total	Volunteers, GBCW, communities
WQR-14	Metals sampling	CRWC	No			Part of WQR-1 total	NHDES, NHCP, communities
HI-6	Biomonitoring continue	CRWC	No			Part of WQR-1 total	volunteers, NHDES, NHCP
NHTAG Funding							
WQR-19	Data to track landfills	NHTAG	yes			Remaining NHTAG balance	EPA TAG grant, volunteers, consultants
WQR-20	Track landfills	NHTAG	yes			Remaining NHTAG balance	EPA TAG grant, volunteers, consultants

Table 11b - Cocheco River Watershed Restoration Plan
Year Two Tasks

Action #	Action/project	Organizations or Communities Involved in the Task	Funding Committed ?	Grant funding	Match	Total cost	Other resources needed
WQR-21	Track Tolend landfill	NHTAG, Dover	yes			Remaining NHTAG balance	EPA TAG grant, volunteers, consultants
Rochester/NRCS							
HI-7	Nuisance species surveys	Rochester DPW	yes	$ 1,500.00	$ 500.00	$ 2,000.00	NRCS
HI-13	Buffer restoration	Rochester DPW	yes	$ 4,650.00	$ 1,550.00	$ 6,200.00	NRCS
DSI-4	City Stormwater management	Rochester DPW	yes	$ 18,750.00	$ 6,750.00	$ 25,000.00	NRCS
HI-10	Solid waste survey	Rochester DPW	yes			included above	NRCS
HI-16	River cleanup	Rochester DPW	yes			included above	NRCS
CRWC Coordination Only							
HI-15	Erect osprey platform	CRWC	yes				EXT, Thompson School;,ASNH, PSNH
Targeted Watershed Grant							
DSI-1	Educ. Activity, Impervious surfaces	CRWC, UNH Stormwater Center	No				Targ. Watershed Grant appl.
DSI-2	Educ. Activity, min. impact development	CRWC, UNH Stormwater Center	No				Targ. Watershed Grant appl.
DSI-3	Snow dump innovation	CRWC, UNH Stormwater Center, Rochester DPW	No				Targ. Watershed Grant appl.
DSI-10	ID restoration sites, stormwater infrastructure	CRWC, UNH Stormwater Center	No	$ 5,000.00	$ 5,000.00		Targ. Watershed Grant appl.
DSI-11	Stormwater treatment demonstration projects	CRWC, UNH Stormwater Center	No				Targ. Watershed Grant appl.
DSI-17	Educate about riparian buffers, Berry Brook	CRWC, UNH Stormwater Center, Dover, EXT, NHDES	No				Targ. Watershed Grant appl.
DSI-25	Berry Brook Restoration, continue	Dover Env., CRWC, UNH Stormwater Center	No				Targ. Watershed Grant appl.
Other Funding Sources							
PPE-12	GoMI Summer institute	CRWC, GoMI	No			$ 20,000.00	GOMI, Teams, international support

Funding for the first two years of plan implementation will be requested through the DES Watershed Restoration Grant Program. The specific tasks included in the grant request include the following:

1. Hiring a Watershed Coordinator and forming the RTAC.
2. Recruiting, training, and managing volunteers to participate in restoration activities, including monitoring and trash cleanups.
3. Participating in water quality monitoring as described in the monitoring plan.
4. Planning and execution of an annual Photo Contest and River Fest.
5. Providing education on watershed issues.
6. Erecting two osprey platforms.
7. Providing two canoe trips for community officials.
8. Identifying and correcting flawed stormwater infrastructure.
9. Identifying and pursuing other funding opportunities.
10. Promoting the restoration plan through media relations, development of outreach and education programs and materials, and public participation.
11. Building and strengthening partnerships for restoration implementation.

Funding for the Restoration Program

The funding for restoration will come from a variety of sources. The primary funding vehicle will be the DES Watershed Restoration Grant Program. This is a federally funded program, therefore a 40% match is required as part of the grant agreement. The coordinator will track the match including in-kind contributions. Matching funds will be generated through donation of rental space, meeting space, professional services and volunteer time.

Cost Estimates A cost estimate for the first two years of the program has been developed and is summarized in Table 12. The total project cost for the first two years is estimated at $164,250. The focus of the first two years will be environmental monitoring, outreach and education, stormwater management education and restoration, buffer restoration and solid waste cleanup, and securing funding for years three through nine.

Table 12
Estimated Budget for Plan Implementation – Years One and Two

Budget Item	Match ($)	Grant Funds ($)
Salary, Office & Advisory costs	$ 52,167.00	$ 89,800.00
Environmental Monitoring	$ 11,250.00	$ 11,250.00
Outreach and Education	$ 10,700.00	$ 12,500.00
Stormwater Management Education and Restoration	$ 3,000.00	$ 3,000.00
Buffer restoration and solid waste cleanup	$ 1,750.00	$ 1,750.00
Totals	$ 78,867.00	$ 78,867.00
Total Year One and Year Two Costs		$ 197,167.00

Notes:
Watershed Coordinator will work half time for two years.
A part time administrative assistant and book keeper will be hired
Office support will be provided by UNH-SCCE
DES Grant request for monitoring for year two only. Year one monitoring from other funds
Outreach and education is for River Fest, photo contest, GOMI
Stormwater request is for education and BMP handbook
Buffer restoration is pet and yard waste impact reduction

Strategy Implementation will depend on building a strong volunteer base with strong public participation in order to change attitudes and behaviors towards the river. The implementation of the restoration activities will be coordinated with the ongoing efforts of watershed communities to upgrade stormwater systems and to address stormwater runoff. Implementation will be coordinated with the goals of the DES, NHCP, NHEP, and NRCS as the water quality and habitat improvement activities on the Cocheco will have a direct positive impact on the Great Bay Estuary.

Budget Management The administration of grant funding for years one and two for the Coordinator position and restoration activities will be the responsibility of the CRWC. The CRWC will provide all grant reports to the DES for periodic payment as specified in the watershed grant and all other funding sources. The Coordinator will provide preliminary reporting and documentation to the CRWC as needed. The Coordinator will also be responsible for tracking all in-kind and cash match amounts as part of quarterly budget tracking and submitting reimbursement requests to DES for payment. The budget will be tracked quarterly and provided to the CRWC for review.

Additional Funding Sources An important function of the Board and RTAC is identifying additional sources of funding for the restoration program. This may include foundation grants, fundraising and procurement of in-kind services to assist the Coordinator in implementation. The Coordinator will also bring potential funding sources to the attention of the Board on a regular basis.

Watershed Monitoring Plan Coordination and Evaluation

The *Cocheco River Watershed Monitoring Plan - 2006 and 2007* was developed to fill the data gaps identified in the *Cocheco River Watershed Environmental Quality Report* and to monitor the long-term success of the restoration program. The monitoring plan includes water quality monitoring, bio-monitoring, trash surveys, illicit discharge identification, and several special studies. The monitoring results will be used to assess the change in the quality of the Cocheco River. Every two years, DES will determine if the designated uses for the Cocheco River are being met based on the water quality data and information collected through the monitoring activities. The three uses that will be measured initially are Primary Contact Recreation, Secondary Contact Recreation and Aquatic Life.

The CRWC will continue to participate in the DES Volunteer River Assessment Program (VRAP) and this program will serve as the backbone of the monitoring efforts. The water quality data collected by volunteer monitors are used by DES to assess the status of the designated uses. Additionally, biomonitoring of macroinvertebrate species will augment the aquatic life use assessment. Trash surveys and illicit discharge surveys will identify specific sites in the watershed that need remediation such as debris removal and illicit discharge fixes, respectively.

Evaluating Success

The success of the implementation program will be measured in a variety of ways. The four goals of the *Watershed Restoration and Implementation Plan for the Cocheco River* have numerous objectives. Each objective has a long-term target and a tool or method for measuring the progress toward the target. Progress toward the water quality restoration goal and objectives will be measured through field monitoring and various programmatic indicators as described in the *Cocheco River Watershed Monitoring Plan - 2006 and 2007*. The other three goals (Public Perception and Education, Habitat Improvement, and Development and Stormwater Impacts) will be measured using various surveys and outcomes. Appendix D lists the long-term targets and tools to meet each objective.

The success of implementation will be evaluated on an annual basis. The Coordinator will summarize the accomplishments of the program for the year according to the established goals and objectives. The CRWC board will then assess the percent completion of the various objectives developed for each goal as part of the restoration plan. This will be accomplished using the long-term targets listed in Appendix D. The Primary Partners will be invited to provide comments for the evaluation process and attend the evaluation session. This evaluation will serve several purposes. The list below describes some benefits of this evaluation process.

- It will demonstrate to the Board, the Coordinator and RTAC where programs have been successful and where improvements can be made.
- It will allow the Coordinator to suggest a re-prioritization of actions, if needed.
- It will demonstrate to the watershed communities, the value of the restoration program and how it has improved the quality of the Cocheco River Watershed.
- It will demonstrate to the DES and the USEPA, the value of the project and will provide substantiation for future funding.

Glossary of Acronyms
Organizations or Programs included within *Watershed Restoration and Implementation Plan for the Cocheco River*

Abbreviation	Organization Name
ASNH	Audubon Society of New Hampshire
BMP	Best Management Practices
CRWC	Cocheco River Watershed Coalition
DPW	Departments of Public Works
GoMI	Gulf of Maine Institute
GPCF	Greater Piscataqua Community Foundation
LWCF	Land and Water Conservation Fund (a part of the US Department of the Interior)
NH Dept of Ag	New Hampshire Department of Agriculture
NHCP	New Hampshire Coastal Program
NHDES or DES	New Hampshire Department of Environmental Services
NHDOT	New Hampshire Department of Transportation
NHDRED	New Hampshire Department of Resources and Economic Development
NHEP	New Hampshire Estuaries Project
NHFG	New Hampshire Fish and Game Department
NHNHI	New Hampshire Natural Heritage Institute (a division of NHDRED)
NHTAG	New Hampshire Technical Assistance Group
NRCS	Natural Resource Conservation Service (a division of the US Dept of Agriculture)
NRI	Natural Resource Inventory
NROC	Natural Resources Outreach Coalition
PSNH	Public Service Company of New Hampshire
SNHRCD	Southern New Hampshire Resource and Conservation District
SRC	Strafford Rivers Conservancy
SRPC	Strafford Regional Planning Commission
TNC	The Nature Conservancy
TU	Trout Unlimited
UNH	University of New Hampshire - Durham, NH
UNHCE	University of New Hampshire Cooperative Extension
UNHT[2]	University of New Hampshire Technology Transfer Center
USACoE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
VBAP	Volunteer Biological Assessment Program
VRAP	Volunteer River Assessment Program

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Appendices

Watershed Restoration and Implementation Plan for the Cocheco River

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Appendix A

Cocheco River Watershed Assessment Units, Designated Uses and Impairments

Appendix A. Assessment Units, Designated Uses and Impairments

Assessment Unit	Designated Use	Is the Use Supported?	Cause of Impairment
Upper Cocheco (19 assessment units)	Aquatic Life	Not Supporting for five assessment units Fully Supporting for none Not assessed eight assessment units Insufficient Information six assessment units	Low pH for four AUs Non-native aquatic plants present in one AU
	Primary Contact Recreation	Not Supporting for two assessment units Fully Supporting for two assessment units Not assessed for ten assessment units Insufficient information for five assessment units	Elevated *E.coli* (bacteria)
	Secondary Contact Recreation	Not Supporting for zero assessment units Fully Supporting for four assessment units Not assessed for ten assessment units Insufficient information for five assessment units	--
	Fish Consumption	Not Supporting for all nineteen assessment units	Mercury in fish tissue
Axe Handle Brook (9 assessment units)	Aquatic Life	Not Supporting for two assessment units Fully Supporting for zero assessment units Not assessed for six assessment units Insufficient information for one assessment unit	Low pH
	Primary Contact Recreation	Not Supporting for one assessment units Fully Supporting for one assessment units Not assessed for six assessment units Insufficient information for one assessment unit	Elevated *E. coli* (bacteria)

Assessment Unit	Designated Use	Is the Use Supported?	Cause of Impairment
	Secondary Contact Recreation	Not Supporting for one assessment unit Fully Supporting for zero assessment units Not assessed for six assessment units Insufficient information for two assessment units	Elevated *E. coli* (bacteria)
	Fish Consumption	Not Supporting for all nine assessment units	Mercury in fish tissue
	Drinking Water After Adequate Treatment	Fully Supporting for the one assessment unit that was assessed (Rochester Reservoir)	--
Middle Cocheco (13 assessment units)	Aquatic Life	Not Supporting for six assessment units Fully Supporting for zero assessment units Not assessed for seven assessment units Insufficient information for zero assessment units	Elevated Al, low DO, low pH, Benthic macroinvertebrates monitoring results, Bioassessment and Habitat survey results, presence of nonnative aquatic plants
	Primary Contact Recreation	Not Supporting for four assessment units Fully Supporting for one assessment units Not assessed for seven assessment units Insufficient information for one assessment units	Elevated *E. coli* (bacteria)
	Secondary Contact Recreation	Not Supporting for one assessment units Fully Supporting for four assessment units Not assessed for seven assessment units Insufficient information for one assessment unit	Elevated *E. coli* (bacteria)
	Fish Consumption	Not Supporting	Mercury in fish tissue

Assessment Unit	Designated Use	Is the Use Supported?	Cause of Impairment
Lower Isinglass (6 assessment units)	Aquatic Life	Not Supporting for one assessment unit Fully Supporting for zero assessment units Not assessed for four assessment units Insufficient information for one assessment unit	Low dissolved oxygen
	Primary Contact Recreation	Not Supporting for one assessment unit Fully Supporting for one assessment unit Not assessed for four assessment units Insufficient information for zero assessment units	Elevated *E. coli* (bacteria)
	Secondary Contact Recreation	Not Supporting for zero assessment units Fully Supporting for two assessment units Not assessed for five assessment units Insufficient information for zero assessment units	--
	Fish Consumption	Not Supporting	Mercury in fish tissue
Lower Cocheco (21 assessment units)	Aquatic Life	Not Supporting for four assessment units Fully Supporting for zero assessment units Not assessed for seventeen assessment units Insufficient information for zero assessment units	Low pH
	Primary Contact Recreation	Not Supporting for two assessment units Fully Supporting for three assessment units Not assessed for sixteen assessment units Insufficient information for zero assessment units	Elevated *E. coli* (bacteria)

Assessment Unit	Designated Use	Is the Use Supported?	Cause of Impairment
Lower Cocheco Continued	Secondary Contact Recreation	Not Supporting for zero assessment units Fully Supporting for four assessment units Not assessed for seventeen assessment units Insufficient information for zero assessment units	--
	Fish Consumption	Not Supporting	Mercury in fish tissue

Appendix B

Calculation of Bacterial, Nutrient and Sediment Loading

for Cocheco River Subwatersheds

Description of Pollutant Load Estimate Calculations

Pollutant load estimates were calculated using the Simple Method (CWP, 2000) for each of the five subwatersheds. The estimated pollutant loads allowed for comparisons of the relative differences in stormwater pollutant load for phosphorus, bacteria and total suspended solids (TSS) among the subwatersheds. This calculation requires a minimal amount of information, which was easily accessible for the Cocheco River subwatersheds. The subwatershed drainage area numbers were provided by the Department of Environmental Services using GIS-based data in NH GRANIT (State GIS portal) as well as the impervious cover data. The Simple Method allows for the use of local, regional or national data sources for stormwater pollutant concentrations. The total phosphorus, bacteria (*E. coli*), and TSS concentrations were based on the average concentrations for urban (high intensity residential) and residential (low intensity residential) sites reported from a Concord, New Hampshire stormwater characterization study (NHDES, 1997). The annual precipitation of 40.15 inches was reported in Fargo (2002).

The calculation for TSS and annual total phosphorus load is

$L = 0.226 * R * C * A$

Where: L = Annual load (lbs)
R = Annual runoff (inches)
C = Pollutant concentration (mg/l)
A = Area (acres)
0.226 = Unit conversion factor

The calculation for annual bacteria loads is

$L = 1.03 * 10^{-3} * R * C * A$

Where: L = Annual load (Billion Colonies)
R = Annual runoff (inches)
C = Bacteria concentration (#/100 ml)
A = Area (acres)
$1.03 * 10^{-3}$ = Unit conversion factor

Pollutant concentrations from NHDES (1997) and the Simple Method default values that were used in these calculations are shown in the table below.

Pollutants/land use types	Low Intensity Residential	High Intensity Residential	Commercial/ Industrial/ Transportation (used Simple Method average defaults for commercial, industrial and roadway)
TSS (mg/l)	28	58	115
Total Phosphorus (mg/l)	0.15	1.08	0.36
Bacteria (*E. coli*) (#/100 ml)	3997	6563	20,000

Appendix C

Detailed Action Plans for Cocheco River Watershed Restoration

Public Participation and Education Action Plans

Action Plan PPE-1

Title of Action: *Increase the number of access points for boating and recreation*

Associated Goal: Public Perception and Education Goal

Associated Objective: Improve public perception through increased access to the river for recreation/enjoyment

Steps Needed to Complete the Action:

1. Identify current points of access to river and the ownership, description, and condition of each access. Identify needed improvements to allow for appropriate access by the public.
2. Work with the owners and the community to improve access points as needed.
3. Locate other areas of public ownership and right of ways, and plan for new access for a variety of uses as environmentally appropriate.
4. Work with communities, NHFG and user groups to establish new access points.
5. Update public access guide with the help of communities, user groups (such as Trout Unlimited), and NHFG
6. Plan activities to introduce new access to public, including stewardship and educational opportunities.

Potential Partners: *CRWC, communities, NHFG, user groups*

Location of Action (particular subwatershed or site):
All subwatersheds

Costs and Funding (budget and potential funding source):
$5,000 for publications. Volunteers. Unknown costs for establishing new access points.

Expected Benefits:
Increased recreational opportunities, appreciation of the river, familiarity with water resources

Timetable: Near to Mid term

Type of Action (choose one or more):
☐ Regulatory x Research x Infrastructure Change x Voluntary

Action Plan PPE-2

Title of Action *Establish an annual Cocheco River Festival day*.

Associated Goal: Public Perception and Education Goal

Associated Objectives:

○ Improve public perception through increased access to the river for recreation and enjoyment
○ Establish objective and subjective values of the river.
○ Use Rochester and Dover riverwalks to improve public perception of the river in both urban and rural settings.
○ Encourage public participation in all aspects of river restoration activities.

Steps Needed to Complete the Action:

1. Form committee and plan event.
2. Seek funds, cooperation and participation of multiple and varied interests in the river, watershed communities and state environmental organizations and agencies.
3. Obtain permission and cooperation from municipality.
4. Promote event.
5. Organize and hold event.
6. Evaluate and make changes/improvements as necessary.

Potential Partners: CRWC, businesses, natural resource agencies, communities, civic organizations, sportsmen, recreational interests, schools.

Location of Action (particular subwatershed or site):

Downtown Dover or Rochester

Costs and Funding (budget and potential funding source):

Business and community support, GPCF, other grant funding sources.

Expected Benefits:

Public participation and education.

Timetable: Near to Long Term

Type of Action (choose one or more):

☐ Regulatory ☐ Research ☐ Infrastructure Change X Voluntary

Action Plan PPE-3

Title of Action*: Determine the economic benefit of an improved river corridor.*

Associated Objective: Establish objective and subjective values of the river.

Steps Needed to Complete the Action:

1. Contact UNH or Antioch New England Graduate School natural resources and/or resource economic departments for interested faculty and graduate students.
2. Foster research of economic benefits.
3. Publish white paper including ecological, economic, aesthetic, recreational, and existence values.
4. Provide information to media, communities, and business organizations. Use information to improve proposals to funding agencies and foundations.

Potential Partners: CRWC, universities, communities

Location of Action (particular subwatershed or site):
All subwatersheds.

Costs and Funding (budget and potential funding source):
GPCF grant, NHEP, NHCP possible sources of funding

Expected Benefits:
Changed public and business perception towards the river.

Timetable: Near to Mid term

Contingencies: Volunteer, university resources availability.

Type of Action (choose one or more):
☐ Regulatory X Research ☐ Infrastructure Change X Voluntary

Action Plan PPE-4

Title of Action*: Determine the economic impact of making the Cocheco a NH River Protection and Management Program designated river.*

Associated Goal: Public Perception and Education Goal

Associated Objective: Establish objective and subjective values of the River.

Steps Needed to Complete the Action:

1. Contact UNH or Antioch New England Graduate School natural resources and/or resource economic departments for interested faculty and graduate students.
2. Support and foster research of economic benefits.
3. Publish white paper on the subject.
4. Provide information to media, communities, and business organizations.
5. Discuss next steps with the Cocheco River Watershed Coalition board and membership.

Potential Partners: CRWC, universities, communities

Location of Action (particular subwatershed or site):
All subwatersheds.

Costs and Funding (budget and potential funding source):
Greater Piscataqua Community Foundation (GPCF) grant, NHEP, NHCP are possible sources of funding

Expected Benefits:
Changed public and business perception towards the river. Associated benefits of NH Rivers Protection and Management Program.

Timetable: Long term

Contingencies: Volunteer, university resources availability. Completion of other valuations of the river.

Type of Action (choose one or more):
☐ Regulatory X Research ☐ Infrastructure Change X Voluntary

Action Plan PPE-5

Title of Action*: Determine the economic benefit of existing and potential sources of water supply along the Cocheco River.*

Associated Goal: Public Perception and Education Goal

Associated Objective: Establish objective and subjective values of the River.

Steps Needed to Complete the Action:

1. Seek partners and funding for research.
2. Design and implement study.
3. Present findings to the public.

Potential Partners: CRWC, university, communities, NHDES.

Location of Action (particular subwatershed or site):
All subwatersheds.

Costs and Funding (budget and potential funding source):
$20,000 total project costs. Can be reduced by volunteer and student participation.

Expected Benefits:
Better understand benefits of water supply, planning and decision-making.

Timetable: Near term

Contingencies: Volunteer, university resources availability. Completion of USGS groundwater study now in progress.

Type of Action (choose one or more):

☐ Regulatory X Research ☐ Infrastructure Change X Voluntary

Action Plan PPE-6

Title of Action: *Research stakeholder perception of the values of Cocheco River and use to build greater stewardship of the river.*

Associated Goal: Public Perception and Education Goal

Associated Objective: Establish objective and subjective values of the River.

Steps Needed to Complete the Action:

1. Design project with partners.
2. Conduct surveys and web based interviews.
3. Analyze and further explore based on findings.
4. Develop messages/activities targeted for stakeholder based on findings.

Potential Partners: CRWC with research partners and community – conservation commissions.

Location of Action (particular subwatershed or site):

All subwatersheds.

Costs and Funding (budget and potential funding source):

$35,000 project costs if done by university. Reduced by volunteer student and community participation.

Expected Benefits:

More efficient and effective outreach activities.

Timetable: Near term – 2 year project period.

Contingencies: Volunteer, university resources.

Type of Action (choose one or more):

☐ Regulatory X Research ☐ Infrastructure Change ☐ Voluntary

Action Plan PPE-7

Title of Action: *Conduct Cocheco River Photo Contest*

Associated Goal: Public Perception and Education Goal

Associated Objectives:

- Improve public perception through increased access to the river for recreation/enjoyment
- Establish objective and subjective values for the river.
- Encourage public participation in all aspects of river restoration activities.

Steps Needed to Complete the Action:

1. Plan Photo Contest in association with Cocheco Festival Event or Rochester Fair, or other event in the watershed..
2. Solicit photo entries.
3. Solicit awards. Hold contest and award prizes. Issue press releases.
4. Develop agreement for CRWC to use photos for publicity and publications.
5. Use photos in promotional and interpretive materials.

Possible Partners:
CRWC and businesses in watershed.

Location of Action (particular subwatershed or site):
Location of chosen festival for event.

Costs and Funding (budget and potential funding source):
Business sponsorship $1,000

Expected Benefits:
Greater visibility and public awareness of the beauty of the river.

Timetable:
Near term

Contingency: Association with Festival or event, and development of partnerships.

Type of Action (choose one or more):
☐ Regulatory ☐ Research ☐ Infrastructure Change X Voluntary

Action Plan PPE-8

Title of Action: *Provide promotional efforts at downtown riverwalks to educate public about the Cocheco River.*

Associated Objectives:

○ Use Rochester and Dover riverwalks to improve public perception in both urban and rural settings.
○ Demonstrate that the river is a sum of all the large and small streams that feed into the Cocheco River and that attention to these streams is important.

Steps Needed to Complete the Action:

1. Assess available educational materials and adapt them for use on the Cocheco River.
2. Develop new materials as appropriate.
3. Develop outreach programs to use in conjunction with community events and activities.
4. Become involved as partners in planning and implementation of events and activities.
5. Participate in the development of the Rochester Riverwalk.

Possible Partners:
CRWC, communities, UNHCE educators, and businesses in watershed.

Location of Action (particular subwatershed or site):
Central Dover and Rochester. Farmington in the future.

Costs and Funding (budget and potential funding source):
$5,000. Grant funding for development and business contributions. Volunteer participation.

Expected Benefits:
Increased knowledge and awareness of river resources and community benefits.

Timetable: Near to long term
2006 spring participation in Rochester River walk planning.
2006 fall assessment of educational materials. Implement in 2007 and 2008.

Contingency: Association with River Festival or other event

Type of Action (choose one or more):
☐ Regulatory X Research X Infrastructure Change X Voluntary

Action Plan PPE-9

Title of Action*: Post Cocheco River and tributary stream signs at road crossings.*

Associated Goal: Public Perception and Education Goal

Associated Objectives:

○ Work closely with regional, state, and national organizations and agencies on shared goals and objectives.
○ Encourage public participation in all aspects of river restoration activities.

Steps Needed to Complete the Action:

1. Determine which road crossings will get signs.
2. Research state and local regulations for signs (e.g. size, type, location). Design signs.
3. Seek funding for sign making and posting. Submit paperwork for necessary permits and permission.
4. Erect signs.
5. Publicize efforts.

Potential Partners: CRWC, municipal public works departments, NHDOT, NHDES.

Location of Action (particular subwatershed or site):

At road crossings of river and tributaries in all subwatersheds.

Costs and Funding (budget and potential funding source):

Approximately $40 per sign in 50 locations = $2,000 to start.

Expected Benefits:

Build public awareness of water bodies and their place in communities.

Timetable: Mid term

Type of Action (choose one or more):

☐ Regulatory ☐ Research X Infrastructure Change X Voluntary

Action Plan PPE-10

Title of Action*: Publicize findings and successes of the Cocheco River Restoration Program and regularly announce volunteer opportunities.*

Associated Goal: Public Perception and Education Goal

Associated Objective:

- Improve public perception through increased access to the River for recreation/enjoyment.
- Encourage public perception through increased access to the River for recreation and enjoyment.
- Demonstrate that the River is a sum of all the large and small streams that feed into the Cocheco and that attention to all these streams is important.

Steps Needed to Complete the Action:

1. Develop new publicity mechanisms integral to project planning.
2. Seek new and reinforce existing media relationships.
3. Develop a road show for board members and public about restoration management and planning.
4. Participate in regular communications with boards about CRWC and restoration activities in their town.
5. Prepare media releases and invite media to participate in activities and implementation of publicity plans. Encourage volunteer participation in activities through press releases and presentations.
6. Make presentations to boards and citizen groups.
7. Evaluate successes and modify as needed.

Potential Partners: CRWC, town land use boards, media representatives, natural resource agencies, communities, volunteers.

Location of Action (particular subwatershed or site): All subwatersheds – restoration sites and meeting places.

Costs and Funding (budget and potential funding source):

Volunteer participation, 319 Funding, other grants, communities.

Expected Benefits:

Increased awareness of Cocheco River restoration actions and knowledge of river resources.

Timetable: Ongoing. Near to long term

Type of Action (choose one or more):

☐ Regulatory ☐ Research ☐ Infrastructure Change X Voluntary

Action Plan PPE-11

Title of Action*: Work with other watershed non-governmental organizations (NGO's) on common goals.*

Associated Goal: Public Perception and Education

Associated Objective:

- Work closely with regional, state and national organizations and agencies on shared goals and objectives.
- Demonstrate that the river is a sum of all the large and small streams that feed into the Cocheco and that attention to all these streams is important.

Steps Needed to Complete the Action:

1. For all activities, look for opportunities for partnerships with other NGO's.
2. Develop and improve mechanisms for sharing information. – agendas, results, news and opportunities.
3. Improve networking among organizations in the region by offering shared space at public events, making their promotional materials available at CRWC events, sharing credit in press releases, and attending other organizations' annual meetings to make contacts and share information..
4. Explore opportunities to plan shared outreach with other NGO's like the River Festival, press conferences on shared projects, etc.

Potential Partners: CRWC, Moose Mountain Regional Greenways, Strafford Rivers Conservancy, Trout Unlimited, Ducks Unlimited, for example.

Location of Action (particular subwatershed or site): All subwatersheds.

Costs and Funding (budget and potential funding source):

No direct costs.

Expected Benefits:

More public awareness and recruitment opportunities

Timetable: Spring 2006 and Ongoing. Near to long term.

Type of Action (choose one or more):

☐ Regulatory ☐ Research ☐ Infrastructure Change X Voluntary

Action Plan PPE-12

Title of Action*: Engage youth in river restoration.*

Associated Goal: Public Perception and Education Goal

Associated Objective:

- Encourage public participation in all aspects of river restoration activities.
- Conduct youth civic engagement activities focused on river restoration.

Steps Needed to Complete the Action:

1. Identify and recruit community teams for Gulf of Maine Institute program of Civic Engagement.
2. Supplement programming of 4-H, schools, scouts, and other youth groups with site-specific education related to the Cocheco River watershed and the Great Bay watershed.
3. Cooperatively seek resources and carry out programming with community youth.

Potential Partners: CRWC, schools, Gulf of Maine Institute, 4-H, Girl and Boy Scouts and other youth organizations.

Location of Action (particular subwatershed or site): All subwatersheds.

Costs and Funding (budget and potential funding source):

Combination of grant funding and resource contributions by partner organizations.

Expected Benefits:

Build interest in the river with local youth to assure river stewardship for the future.

Timetable: Begin recruitment in 2006, then ongoing. Near to long term.

Type of Action (choose one or more):

☐ Regulatory X Research ☐ Infrastructure Change X Voluntary

Action Plan PPE-13

Title of Action*: Develop outreach materials describing Cocheco River Restoration and Monitoring.*

Associated Goal: Public Perception and Education Goal

Associated Objective:

- Demonstrate that the River is a sum of all the large and small streams that feed into the Cocheco and that attention to all these streams is important.
- Encourage public participation in all aspects of river restoration activities.

Steps Needed to Complete the Action:

1. Identify outreach materials to be developed that will reach the broadest segment of the watershed community (brochure, newsletter, website, etc..)
2. Seek resources for developing and producing these tools.
3. Seek volunteers to help develop the materials.
4. Plan and produce outreach materials.
5. Update materials as needed.
6. Periodically evaluate effectiveness of outreach materials.

Potential Partners: CRWC, UNHCE, UNH or MacIntosh College interns, local businesses, municipalities, volunteers.

Location of Action (particular subwatershed or site): All subwatersheds.

Costs and Funding (budget and potential funding source):

Combination of grant funding and resource contributions by businesses and partner organizations.

Expected Benefits:

Expanded visibility, recruitment of volunteers and support, public awareness of goals and river stewardship.

Timetable: Begin process in 2006, then ongoing. Near to long term.

Type of Action (choose one or more):

☐ Regulatory X Research ☐ Infrastructure Change X Voluntary

Water Quality Restoration Action Plans

Action Plan WQR-1

Title of Action: *Modify Sampling Plan to better define and understand causes of anomalous dissolved oxygen, biological oxygen demand, and temperature fluctuations in the Cocheco River watershed.*

Associated Goal: Water Quality Restoration Goal

Associated Objective: Determine and minimize causes of dissolved oxygen and temperature fluctuations within the Cocheco River watershed.

Steps Needed to Complete the Action:

7. Identify sites where DO, temperature, and BOD have been observed to be elevated or anomalous.

8. Modify sampling plan to further define fluctuations or anomalies.

9. Coordinate sampling with other water quality monitoring action plans.

10. Sample, evaluate, and report data findings.

Who is responsible: Volunteers, CRWC, VRAP, UNH, commercial and industrial riparian landowners.

Location of Action (particular subwatershed or site): All subwatersheds.

Costs and Funding (budget and potential funding source): Grants, municipal funding, volunteer match. Approximately $20,000

Expected Benefits: Identified sources of DO variation to assist in remediation planning.

Timetable: Near term to mid term

Contingencies: None

Type of Action (choose one or more):

☐ Regulatory X Research ☐ Infrastructure Change ☐ Voluntary

Action Plan WQR-2

Title of Action: *Reduce sources of depressed dissolved oxygen, increased biological oxygen demand and temperature fluctuations.*

Associated Goal: Water Quality Restoration Goal

Associated Objective: Determine and minimize causes of Dissolved Oxygen and temperature fluctuations within the Cocheco River watershed.

Steps Needed to Complete the Action:

1. Present results of Action WQR-1 to watershed communities and other stakeholders.
2. Determine action plan based on sampling results
3. Seek resources for recommended actions.
4. Correlate effects of dissolved oxygen and temperature variations on health of aquatic organisms and habitat.

Who is responsible: Volunteers, CRWC, local, state and federal agencies

Location of Action (particular subwatershed or site): All subwatersheds

Costs and Funding (budget and potential funding source): To be determined based on sampling results.

Expected Benefits: Ability to implement appropriate remedial actions.

Timetable: Mid term to long term

Contingencies: Biological systems monitoring, Completion of detailed DO/temperature sampling. Funding for action.

Type of Action (choose one or more):

☐ Regulatory X Research x Infrastructure Change ☐ Voluntary

Action Plan WQR-3

Title of Action: Modify bacterial sampling program to further identify sources of bacterial loading.

Associated Goal: Water Quality Restoration Goal

Associated Objective: Understand and eliminate impact of failed septic systems and other bacterial loading on the Cocheco River

Steps Needed to Complete the Action:

1. Design a detailed sampling regime in areas where excessive bacterial concentrations have been documented in the Environmental Quality Report. Utilize microbial source tracking if possible to positively identify sources.
2. Include observation of variable weather conditions that might affect sampling results.
3. Secure funding for additional sampling points.
4. Provide results of sampling to municipalities and DES.
5. Establish new sampling points where needed to further pinpoint sources of bacterial loading. Utilize microbial source tracking if possible to positively identify sources.
6. As sources are identified and eliminated, monitor to show water quality improvement.

Who is responsible: Volunteers, CRWC, UNH, Municipalities, DES

Location of Action (particular subwatershed or site): Farmington, Rochester, Dover

Costs and Funding (budget and potential funding source): To be determined, volunteers, municipalities, NHDES, students.

Expected Benefits: Reduce bacterial loading along river. Improve public health and infrastructure.

Timetable: Near to Mid term

Contingencies: None.

Type of Action (choose one or more):

☐ Regulatory X Research x Infrastructure Change ☐ Voluntary

Action Plan WQR-4

Title of Action: *Evaluate extent of failed septic systems in heavily settled areas.*

Associated Goal: Water Quality Restoration Goal

Associated Objective: - Understand and eliminate impact of failed septic systems and other bacterial loading on the Cocheco River

Steps Needed to Complete the Action:

1. Design intensive sampling regime in areas where excessive bacterial concentrations have been documented in the Environmental Quality Report.

2. Include observation of variable weather conditions that might affect sampling results.

3. Identify dry discharges that may indicate failed septic systems.

4. Provide results of sampling to municipalities.

5. Assist communities to obtain resources and funding to correct failed systems and discharges.

Who is responsible: Volunteers, CRWC, Municipalities

Location of Action (particular subwatershed or site): Farmington, Rochester, Dover

Costs and Funding (budget and potential funding source): To be determined, volunteers, municipalities, NHDES, students.

Expected Benefits: Reduce bacterial loading along river. Improve public health and infrastructure.

Timetable: **Near to Mid term**

Contingencies: None.

Type of Action (choose one or more):

☐ Regulatory X Research x Infrastructure Change ☐ Voluntary

Action Plan WQR-5

Title of Action: *Begin volunteer program to help identify illicit discharges.*

Associated Goal: Water Quality Restoration Goal

Associated Objective: Understand and eliminate impact of failed septic systems and other bacterial loading on the Cocheco River

Steps Needed to Complete the Action:

1. Locate areas of concern based in part on sampling results.
2. Design sanitary survey project.
3. Recruit and train volunteers to perform sanitary surveys.
4. Complete surveys. Evaluate and map data.
5. Report findings to municipalities, NHDES.

Who is responsible: Volunteers, CRWC, Municipalities, NHDES

Location of Action (particular subwatershed or site): Urbanized areas of watershed, particularly Farmington, Rochester, Dover

Costs and Funding (budget and potential funding source):

Approximately $10,000 from grants – NHEP, NHDES, NHCP**,** municipalities, volunteers.

Expected Benefits: Reduce bacterial loading along river. Improve public health and infrastructure.

Timetable: Near to Mid term

Contingencies: funding, cooperation.

Type of Action (choose one or more):

☐ Regulatory X Research x Infrastructure Change ☐ Voluntary

Action Plan WQR-6

Title of Action: *Evaluate and correct illicit discharges and cross connections near Cocheco River and its tributaries.*

Associated Goal: Water Quality Restoration Goal

Associated Objective: Understand and eliminate impact of failed septic systems and other bacterial loading on the Cocheco River

Steps Needed to Complete the Action:

1. Conduct illicit discharge shoreline surveys.
2. Municipalities conduct smoke and dye tests to determine discharge points.
3. Dry discharge detection and bacterial sampling.
4. Coordinate with municipalities on results and remedies to illicit discharges.
5. Implement appropriate corrective actions by community.

Who is responsible: Volunteers, CRWC, Municipalities, DES

Location of Action (particular subwatershed or site): Farmington, Rochester, Dover

Costs and Funding (budget and potential funding source): To be determined, volunteers, municipalities, NHDES, students.

Expected Benefits: Reduce bacterial loading along river. Improve public health and infrastructure.

Timetable: **Mid term to long term**

Contingencies: None.

Type of Action (choose one or more):

☐ Regulatory X Research x Infrastructure Change ☐ Voluntary

Action Plan WQR-7

Title of Action: *Support efforts to replace or repair failed septic systems or extend town/city sewer services or other appropriate community solutions*

Associated Goal: Water Quality Restoration Goal

Associated Objective: Understand and eliminate impact of failed septic systems and other bacterial loading on the Cocheco River

Steps Needed to Complete the Action:

1. Review bacteria data in tributaries and the river to locate areas of concern.
2. Compared data to sewer service area maps.
3. Work with municipalities and DES to secure resources to support septic system testing and replacement.

Possible Partners: CRWC, Municipalities, DES, public works departments

Location of Action (particular subwatershed or site): Upper and Middle Cocheco - Farmington, Rochester

Costs and Funding (budget and potential funding source): To be determined, volunteers, municipalities, DES.

Expected Benefits: Reduce bacterial loading along river. Improve public health and infrastructure.

Timetable: **Mid to long term**

Contingencies: None.

Type of Action (choose one or more):

☐ Regulatory X Research x Infrastructure Change ☐ Voluntary

Action Plan WQR-8

Title of Action: *Conduct water quality monitoring to verify water quality improvement in areas of septic system repair and illicit discharge corrections.*

Associated Goal: Water Quality Restoration Goal

Associated Objective: Understand and eliminate impact of failed septic systems and other bacterial loading on the Cocheco River

Steps Needed to Complete the Action:

1. Identify areas of infrastructure change and improvement related to bacterial loading.

2. Develop sampling plan to evaluate pre and post replacement activities where bacterial loading was identified.

3. Encourage incorporation of post construction monitoring in septic system permit process.

Who is responsible: **Municipalities**

Location of Action (particular subwatershed or site): Where bacterial loading has been identified and in heavily settled areas of Farmington, Rochester, Dover

Costs and Funding (budget and potential funding source): To be determined, volunteers, municipalities, DES, landowners.

Expected Benefits: Reduce bacterial loading along river. Improve public health and infrastructure. Increased land values.

Timetable: Mid to long term

Contingencies: None.

Type of Action (choose one or more):

X Regulatory X Research x Infrastructure Change ☐ Voluntary

Action Plan WQR-9

Title of Action: *Review existing data to identify areas of elevated phosphorus and nitrogen and modify sampling plan to assess source areas.*

Associated Goal: Water Quality Restoration Goal

Associated Objectives:

Determine and work to reduce sources of elevated nutrients through modification of the sampling program.

Steps Needed to Complete the Action:

1. Identify sampling locations with elevated phosphorus and nitrogen as described in the EQR.
2. Design sampling plan/research to identify sources.
3. Train volunteers to conduct sampling.
4. Implement sampling plan.
5. Analyze data and write report with recommendations to remediate sources.

Potential Partners: CRWC, DES, municipalities, NHCP, NHEP

Location of Action (particular subwatershed or site): Urbanized areas of Upper, Middle and Lower Cocheco

Costs and Funding (budget and potential funding source): EPA 319 Grant funding (approximately $2,000), municipal funding, volunteer match.

Expected Benefits:

Provide basis for water quality improvement.

Timetable: **Near Term**

Contingencies: Funding

Type of Action (choose one or more):

☐ Regulatory X Research ☐ Infrastructure Change X Voluntary

Action Plan WQR-10

Title of Action: *Conduct a nutrient Total Maximum Daily Load (TMDL) allocation study above CRWC sampling point 12-CCH at Watson Road Bridge in Dover.*

Associated Goal: Water Quality Restoration Goal

Associated Objectives:

Determine and work to reduce sources of elevated nutrients (phosphorus, nitrogen compounds) through modification of the sampling program.

Steps Needed to Complete the Action:

1. Design TMDL study.
2. Seek funding.
3. Recruit and train volunteers.
4. Implement sampling program.
5. Work with NHDES to complete TMDL.
6. Publish results and make recommendations.

Potential Partners: CRWC, DES

Location of Action (particular subwatershed or site):

Cocheco River at Watson Road in Dover and upstream.

Costs and Funding (budget and potential funding source): Grant for approximately $10,000 total. Volunteer participation

Expected Benefits:

Better understanding of nutrient loading impacts, basis for improving water quality

Timetable: Near term

Contingencies:

Type of Action (choose one or more):

X Regulatory X Research ☐ Infrastructure Change X Voluntary

Action Plan WQR-11

Title of Action: *Work with municipalities to rigorously apply Best Management Practices (BMPs) for nutrients.*

Associated Goal: Water Quality Restoration Goal

Associated Objectives:

- Determine and work to reduce sources of elevated nutrients through modification of the sampling program.
- Understand and reduce negative impact of stormwater discharge on the Cocheco River.

Steps Needed to Complete the Action:

1. Utilize BMP handbook produced for Action DSI-5 to educate residents, officials, municipal staff and recreational users about keeping excess nutrients away from the river.
2. Choose BMP demonstration site(s) .
3. Present BMP "how-to" programs at demonstration sites.

Potential Partners: CRWC, DES, municipalities, NHCP, NHEP

Location of Action (particular subwatershed or site):

Costs and Funding (budget and potential funding source): Grants, municipal funding, volunteer match. Approximately $10,000

Expected Benefits:

Public understanding of the impacts of stormwater, where the water goes and ultimate change in behavior.

Timetable: Mid to long term

Contingencies: None

Type of Action (choose one or more):

☐ Regulatory ☐ Research ☐ Infrastructure Change X Voluntary

Action Plan WQR-12

Title of Action: *Analyze sampling data and identify existing impacts of stormwater runoff on Cocheco River water quality*

Associated Goal: Water Quality Restoration Goal

Associated Objectives:

Understand and reduce negative impact of stormwater discharge on the Cocheco River.

Steps Needed to Complete the Action:

1. Identify water quality indicators of degraded stormwater.
2. Review existing Cocheco River data to determine existing impacts of stormwater.
3. Report on findings to municipalities and DES.
4. Add water quality parameters to sampling program as needed to better identify stormwater impacts.
5. Work on restoration plans for impacted areas.

Potential Partners: CRWC, DES, municipalities, NHCP, NHEP, VRAP, volunteers.

Location of Action (particular subwatershed or site): All subwatersheds

Costs and Funding (budget and potential funding source): Grants, community funding, volunteer match.

Expected Benefits:

Public understanding of the impacts of these wastes, water quality improvement, and ultimately change behavior.

Timetable: **Mid term**

Contingencies: None

Type of Action (choose one or more):

☐ Regulatory X Research ☐ Infrastructure Change X Voluntary

Action Plan WQR-13

Title of Action: *Educate municipalities and citizens about the impact of pet waste and yard waste on water quality and work to reduce sources.*

Associated Goal: Water Quality Restoration Goal

Associated Objectives:

- Understand and eliminate impact of failed septic systems and other bacterial loading on the Cocheco River
- Determine and work to reduce sources of elevated nutrients through modification of the sampling program, and
- Understand and reduce negative impact of stormwater discharge on the Cocheco River.

Steps Needed to Complete the Action:

1. Educate CRWC and public about impacts and practices of deposition of yard and pet waste.
2. Review pertinent regulations and enforcement mechanisms.
3. Promote innovative ways to comply with these requirements.
4. Advocate enforcement of these regulations with municipalities.

Potential Partners: CRWC, DES, municipalities, SRPC, UNHCE, NHCP.

Location of Action (particular subwatershed or site): All subwatersheds

Costs and Funding (budget and potential funding source): Grants, community funding, volunteer match.

Expected Benefits:

Public understanding of the impacts of these wastes, water quality improvement, and ultimately change behavior.

Timetable: **Near to mid term**

Contingencies: None

Type of Action (choose one or more):

X Regulatory ☐ Research ☐ Infrastructure Change X Voluntary

Action Plan WQR-14

Title of Action: *Add regular metals analysis to sampling program to further define occurrence and sources of elevated metals.*

Associated Goal: Water Quality Restoration Goal

Associated Objectives:

Determine sources and impacts of metals contamination in the Cocheco River Watershed and work to minimize impacts.

Steps Needed to Complete the Action:

1. Review Cocheco EQR and existing Cocheco sampling results to understand known areas of impact.
2. Increase frequency and add additional sampling locations as needed to better define metals distribution.
3. Review sampling methodologies to assure quality assurance and quality control.
4. Sample possible source areas to determine concentration profiles.
5. Locate sources of funding for additional sampling.
6. Review results and report.
7. Further modify sampling plan as needed.
8. Work with municipalities, industry or landowners to reduce metals input to the River.

Potential Partners: CRWC, DES, municipalities, wastewater treatment plants.

Location of Action (particular subwatershed or site): Middle and Lower Cocheco subwatersheds

Costs and Funding (budget and potential funding source): Grants, community funding, volunteer match.

Expected Benefits: Public understanding of the impacts of these metal contamination and water quality improvement.

Timetable: **Near term**

Type of Action (choose one or more):

☐ Regulatory X Research ☐ Infrastructure Change X Voluntary

Action Plan WQR-15

Title of Action: *Research permitted withdrawals from Cocheco River*

Associated Goal: Water Quality Restoration Goal

Associated Objectives:

Research impacts of current and proposed stream flow on Cocheco water quality.

Steps Needed to Complete the Action:

1. Form committee to study this issue.
2. Research withdrawals through DES and USEPA files.
3. Develop a list of withdrawals with status, conditions, and timetables for each permitted withdrawal.

Potential Partners: CRWC, DES, USEPA

Location of Action (particular subwatershed or site):

All subwatersheds

Costs and Funding (budget and potential funding source): Grants, approximately $1,000 total. Volunteer participation

Expected Benefits:

Better understanding of stream flow impacts

Timetable: **Near term**

Contingencies: Cooperation of parties

Type of Action (choose one or more):

☐ Regulatory X Research ☐ Infrastructure Change X Voluntary

Action Plan WQR-16

Title of Action: *Study regional options for wastewater discharge.*

Associated Goal: Water Quality Restoration Goal

Associated Objective:

○ Research the impact of current and proposed stream flow withdrawals on Cocheco water quality.
○ Understand and eliminate impact of failed septic systems and other bacterial loading on the Cocheco River.
○ Determine sources and impacts of metals contamination in the Cocheco River and work to minimize impacts.
○ Determine and minimize causes of dissolved oxygen and temperature fluctuations within the Cocheco River.

Steps Needed to Complete the Action:

1. Review available studies on water withdrawal, and regionalization of wastewater treatment to become informed.

2. Participate in discussions with concerned citizens and municipal decision makers and informed professionals.

3. Participate in public process for decision-making.

Potential Partners: CRWC, communities, legislature, Great Bay Estuary Commission, Estuary Alliance for Sewage Treatment.

Location of Action : All Subwatersheds

Costs and Funding (budget and potential funding source):

To be determined

Expected Benefits:

Informed understanding and decisions on the part of public and local decision makers

Timetable: Near to midterm

Contingencies:

Type of Action (choose one or more):

☐ Regulatory X Research ☐ Infrastructure Change ☐ Voluntary

Action Plan WQR-17

Title of Action: *Look at wastewater treatment discharge options/permits to determine how these plans will impact Cocheco River water quality.*

Associated Goal: Water Quality Restoration Goal

Associated Objectives:

- Research impacts of current and proposed stream flow withdrawals or discharges on Cocheco water quality.
- Determine and minimize causes of dissolved oxygen and temperature fluctuations within the Cocheco River
- Understand and eliminate impact of failed septic systems and other bacterial loading on the Cocheco River.
- Determine sources and impacts of metals contamination in the Cocheco River and work to minimize impacts.

Steps Needed to Complete the Action:

1. Participate in public process associated with WWTP permitting.
2. Evaluate proposed plans based on knowledge of Cocheco River water quality.
3. Seek expertise on subject when necessary.

Potential Partners: CRWC

Location of Action (particular subwatershed or site):

Farmington and Rochester

Costs and Funding (budget and potential funding source): Grant for expertise, approximately $1,000 total. Volunteer participation

Expected Benefits:

Better understanding of WWTP impacts, improved water quality

Timetable: Near to long term

Contingencies: Cooperation of parties

Type of Action (choose one or more):

☐ Regulatory X Research ☐ Infrastructure Change X Voluntary

Action Plan WQR-18

Title of Action: *Review Wastewater Treatment Plant permits and assist in understanding overall impacts of discharge to the River*

Associated Goal: Water Quality Restoration Goal

Associated Objective:

○ Understand extent and eliminate impact of failed septic systems and other bacterial loading on the Cocheco River, and
○ Determine and reduce sources of elevated nutrients through modification of the sampling program.
○ Determine and minimize causes of dissolved oxygen and temperature fluctuations in within the Cocheco River.
○ Research impact of current and proposed stream flow withdrawals on the Cocheco River.

Steps Needed to Complete the Action:

1. Locate and study existing WWTP permits for Farmington and Rochester plants.
2. Review water quality data and compare to treatment process and discharge data.
3. Participate in public decision-making process for permitting WWTPs.

Possible Partners: CRWC, municipalities, DES, public works departments

Location of Action (particular subwatershed or site): Middle and Lower Cocheco - Farmington, Rochester

Costs and Funding (budget and potential funding source): To be determined, volunteers, municipalities, DES.

Expected Benefits: Reduce bacterial and nutrient loading along river. Improve public health and infrastructure.

Timetable: Mid term

Contingencies: None.

Type of Action (choose one or more):

X Regulatory X Research ☐Infrastructure Change X Voluntary

Action Plan WQR-19

Title of Action: *Modify sampling plan to track water quality changes in the vicinity of closed and active landfills along the Cocheco River.*

Associated Goal: Water Quality Restoration Goal

Associated Objectives:

Determine impacts of former land use on Cocheco River water quality and work to reduce those effects.

Steps Needed to Complete the Action:

1. Identify landfill sites that were not identified in the EQR. Determine level of current impact monitoring being conducted by others.
2. Select appropriate parameters, and additional sampling points to design sampling program to document if the landfill(s) are .having a water quality impact.
3. Recruit and train additional volunteer monitors.
4. Request additional sampling as per monitoring recommendations by landfill responsible parties.
5. Supplement requested sampling as per design into CRWC sampling program.
6. Evaluate data and report findings.

Potential Partners: CRWC, DES, municipalities, landfill RP's, USEPA, NH TAG, volunteers

Location of Action (particular subwatershed or site): All subwatersheds

Costs and Funding (budget and potential funding source):

Agency grants, approximately $10,000 per year. Volunteer participation

Expected Benefits:

Improved water quality, better-informed community and officials

Timetable: **Mid to long term**

Contingencies: Cooperation of parties

Type of Action (choose one or more):

X Regulatory X Research ☐ Infrastructure Change X Voluntary

Action Plan WQR-20

Title of Action: *Track progress of evaluation and development of closed and active landfills in Farmington, Rochester and Dover*

Associated Goal: Water Quality Restoration Goal

Associated Objectives:

Determine impacts of former land use on Cocheco River water quality and work to reduce these effects.

Steps Needed to Complete the Action:

1. Request inclusion on abutters list to receive notices and reports.
2. Develop better understanding of pollution attenuation capacity surrounding landfills.
3. Attend meetings on relevant issues.
4. Comment on reports and plans as appropriate.

Potential Partners: CRWC, DES, municipalities, USEPA, NH TAG

Location of Action (particular subwatershed or site): Upper and Middle Cocheco

Costs and Funding (budget and potential funding source):

Volunteer participation

Expected Benefits:

Improved water quality

Timetable: Near to long term

Contingencies: Cooperation of parties

Type of Action (choose one or more):

X Regulatory X Research ☐ Infrastructure Change X Voluntary

Action Plan WQR-21

Title of Action: *Work with Dover to track contaminant attenuation feasibility study at Dover Municipal Landfill on Tolend Road in Dover.*

Associated Goal: Water Quality Restoration Goal

Associated Objectives:

Determine impacts of former land use on Cocheco River water quality and work to reduce these effects.

Steps Needed to Complete the Action:

1. Work with DES, USEPA, and Dover to hasten attenuation monitoring at landfill.
2. Advocate for the process.
3. Review sampling results periodically.

Potential Partners: CRWC, DES, Dover, USEPA, NH TAG

Location of Action (particular subwatershed or site): Lower Cocheco

Costs and Funding (budget and potential funding source):

Volunteer participation

Expected Benefits:

Improved water quality

Timetable: Near to long term

Contingencies: Cooperation of parties

Type of Action (choose one or more):

X Regulatory X Research ☐ Infrastructure Change X Voluntary

Action Plan WQR-22

Title of Action: *Complete a TMDL for dissolved oxygen in the Cocheco River in Farmington and Rochester.*

Associated Goal: Water Quality Restoration Goal

Associated Objectives:

Determine and minimize causes of dissolved oxygen and temperature fluctuations within the Cocheco River.

Steps Needed to Complete the Action:

1. Design a TMDL study.
2. Seek funding for study.
3. Recruit and train volunteers to conduct study.
4. Implement sampling program.
5. Work with DES to complete TMDL.
6. Publish results and make recommendations.

Potential Partners: CRWC, DES, volunteers

Location of Action (particular subwatershed or site): Middle and Upper Cocheco in Farmington and Rochester

Costs and Funding (budget and potential funding source):

Grants and volunteer participation

Expected Benefits:

Better understanding of DO loading in this part of the watershed.

Timetable: **Near term.**

Contingencies: Funding and cooperation.

Type of Action (choose one or more):

X Regulatory X Research ☐ Infrastructure Change X Voluntary

Action Plan WQR-23

Title of Action: *Complete water quality assessment on all assessment units within the watershed so that DES water quality attainment can be evaluated.*

Associated Goal: Water Quality Restoration Goal

Associated Objectives:
Complete water quality monitoring on all Cocheco River watershed assessment units.

Steps Needed to Complete the Action:

1. Work with DES to choose a monitoring station for each assessment unit in the watershed.
2. Develop schedule and methodology to monitor all assessment units for attainment as per the CALM. Include this process in the Cocheco River Watershed Monitoring Plan.
3. Review sampling plan each year to determine what AU's have been added and report progress as part of yearly monitoring evaluation and work plan development for subsequent years.
4. Provide new water quality data to DES on a timely basis.

Potential Partners: CRWC, DES, volunteers, communities, VRAP, USEPA

Location of Action (particular subwatershed or site): **All subwatersheds**

Costs and Funding (budget and potential funding source):
Grants and volunteer participation

Expected Benefits:
Complete assessment of watershed water quality as per the CALM. Full evaluation for reporting to USEPA and Congress which enables funding.

Timetable: Near to long term, complete by 2015

Contingencies: Funding and other resources for water quality testing.

Type of Action (choose one or more):
X Regulatory X Research ☐ Infrastructure Change X Voluntary

Habitat Improvement
Action Plans

Action Plan HI-1

Title of Action: *Gather, analyze, and report on completed habitat studies along the Cocheco River and its tributaries.*

Associated Goal: Habitat Improvement Goal

Associated Objective: Conduct research on and conduct inventories of aquatic and terrestrial species and their habitat to evaluate the present condition of the Cocheco River corridor.

Steps Needed to Complete the Action:

1. Assemble studies on hand and those available from agencies and communities.
2. Review studies for habitat restoration recommendations.
3. Review new (2005) state wildlife management plan.
4. Synthesize material and recommendations for this watershed to supplement restoration planning and implementation activities.
5. Distribute report to CRWC Board, conservation commissions and New Hampshire Fish and Game Department.

Potential Partners: CRWC, conservation commissions, conservation organizations, NHFG.

Location of Action: All subwatersheds

Costs and Funding (budget and potential funding source):

Volunteers, grant for writing supplement.

Expected Benefits:

Better restoration coordination.

Timetable:

Near term

Contingencies: Funding

Type of Action (choose one or more):

☐ Regulatory X Research ☐ Infrastructure Change X Voluntary

Action Plan HI-2

Title of Action: *Encourage communities to conduct natural resource inventories (NRIs) and water resources chapters for master plans.*

Associated Goal: Habitat Improvement Goal

Associated Objective: Conduct research on and conduct inventories of aquatic and terrestrial species and their habitat to evaluate the present condition of the Cocheco River corridor.

Steps Needed to Complete the Action:

1. Learn which communities need to complete or update an NRI.

2. Encourage completion with collection of field data and search for funding.

Potential Partners: CRWC, Conservation Commissions, other watershed organizations, SRPC.

Location of Action: All subwatersheds

Costs and Funding (budget and potential funding source):

$25,000 – state grant funding and municipal contributions.

Expected Benefits:

Gain a better understanding of habitat quality and restoration needs.

Timetable:

Near term

Contingencies: Funding

Type of Action (choose one or more):

☐ Regulatory X Research ☐ Infrastructure Change X Voluntary

Action Plan HI-3

Title of Action: *Work with New Hampshire Natural Heritage Inventory to identify exemplary natural communities in the watershed.*

Associated Goal: Habitat Improvement

Associated Objective: Conduct research on and conduct inventories of aquatic and terrestrial species and their habitat to evaluate the present condition of the Cocheco River corridor.

Steps Needed to Complete the Action:

1. Request information from DRED-NHI about exemplary natural communities that occur in the watershed.
2. Become aware of characteristics to watch for while performing monitoring and assessments.
3. Train volunteers to identify these exemplary communities as they perform other monitoring tasks.
4. Work with municipalities to protect exemplary natural communities.

Potential Partners: TNC, NHDES, DRED- NHI, Conservation Commissions, other watershed organizations, SRPC.

Location of Action: All subwatersheds

Costs and Funding (budget and potential funding source):
Not yet determined

Expected Benefits:
Protection of river resources and exemplary natural communities.

Timetable: Near to mid term

Contingencies: Funding

Type of Action (choose one or more):
☐ Regulatory X Research ☐ Infrastructure Change X Voluntary

Action Plan HI-4

Title of Action: *Review collected data and determine additional areas that need buffer and habitat surveys and complete surveys as needed.*

Associated Goal: Habitat Improvement Goal

Associated Objective: Conduct research on and inventories of aquatic and terrestrial species and their habitat to evaluate the present condition of Cocheco River habitat.

Steps Needed to Complete the Action:

1. Review collected habitat data to determine areas where buffer surveys have been completed.
2. Prioritize areas needing additional surveys.
3. Work with DES, NHFG and other agencies to identify an appropriate buffer survey format and procedure.
4. Seek funding and volunteers for completing surveys.
5. Train volunteers.
6. Complete surveys as needed until all buffer areas are surveyed.

Potential Partners: CRWC, landowners, DES, NHFG, UNHCE, ASNH, municipalities.

Location of Action: All subwatersheds

Costs and Funding (budget and potential funding source):

To be determined

Expected Benefits:

Improved understanding of wildlife and instream habitat and land use changes

Timetable: Near to mid term

Type of Action (choose one or more):

☐ Regulatory **x** Research ☐ Infrastructure Change X Voluntary

Action Plan HI-5

Title of Action: *Research and report on impacts and benefits of gravel pits, agricultural land, and other cultural open space in the riparian zone of the Cocheco River corridor.*

Associated Goal: Habitat Improvement Goal

Associated Objective: Conduct research on and inventories of aquatic and terrestrial species and their habitat to evaluate the present condition of Cocheco River habitat.

Steps Needed to Complete the Action:

1. Assess wildlife populations in gravel pits, agricultural lands, and other cultural features along the corridor.

2. Assess impacts of current management practices on river quality and habitat.

3. Seek advice of wildlife biologists and managers to evaluate the present status and management options for these lands.

4. Make recommendations for gravel pit restoration and/or management where appropriate. Make recommendations for agricultural land management or restoration where appropriate.

Potential Partners: CRWC, landowners, NHFG, UNHCE, ASNH, municipalities, New Hampshire Department of Agriculture

Location of Action: Farmington, Rochester and Dover

Costs and Funding (budget and potential funding source):
To be determined

Expected Benefits:
Improved understanding of wildlife and instream habitat and land use changes

Timetable: Near term

Contingencies:

Type of Action (choose one or more):
☐ Regulatory **x** Research ☐ Infrastructure Change **X** Voluntary

Action Plan HI-6

Title of Action: *Establish chemical, physical and biological monitoring stations to determine links between biological and chemical changes along the River.*

Associated Goal: Habitat Improvement Goal

Associated Objective: Conduct research on and conduct inventories of aquatic and terrestrial species and their habitat to evaluate the present condition of the Cocheco River corridor.

Steps Needed to Complete the Action:

1. Re-examine present monitoring sites and related data to identify correlations.
2. Work with VRAP and VBAP to modify monitoring plan.
3. Recruit and train monitors, and obtain monitoring equipment
4. Implement integrated monitoring project.
5. Evaluate results and check correlations
6. Report results.

Potential Partners: VRAP & VBAP, DES, CRWC, Conservation Commissions, other watershed organizations.

Location of Action: All subwatersheds

Costs and Funding (budget and potential funding source):

$25,000 – state grant funding and voluntary cooperation.

Expected Benefits:

Gain a better understanding of organisms in the river and their relationship with water quality.

Timetable:

Near to long term

Contingencies: Funding

Type of Action (choose one or more):

☐ Regulatory X Research ☐ Infrastructure Change X Voluntary

Action Plan HI-7

Title of Action: *Survey distribution and determine causes of terrestrial and aquatic nuisance species.*

Associated Goal: Habitat Improvement Goal

Associated Objective: Determine the distribution of nuisance aquatic and terrestrial species and habitat to evaluate the present condition of Cocheco River habitat.

Steps Needed to Complete the Action:

1. Identify species of interest and their preferred habitat. Research known waters or land where invasives are present. Work with the NH Invasive Species Committee (advisory group to the NH Department of Agriculture) and DES to identify survey needs.

2. Train volunteers to do survey.

3. Perform appropriate surveys and gather data and analyze.

4. Make information available to public and conservation community.

Potential Partners: NHDES, UNHCE, CRWC, Conservation Commissions, Weed Watchers

Location of Action: All watershed communities**.**

Costs and Funding (budget and potential funding source):

To be determined

Expected Benefits:

Information will provide baseline for management decisions.

Timetable:

Near to long term

Contingencies:

Type of Action (choose one or more):

☐ Regulatory X Research ☐ Infrastructure Change ☐ Voluntary

Action Plan HI-8

Title of Action: *Determine the cost and impact of nuisance aquatic species such as variable milfoil and duckweed on Cocheco River habitat and water quality*

Associated Goal: Habitat Improvement Goal

Associated Objective: Determine the distribution of nuisance aquatic and terrestrial species and habitat to evaluate the present condition of Cocheco River habitat.

Steps Needed to Complete the Action:

1. Working with DES (responsible for the evaluation and listing of aquatic plant species under RSA 487:16a determine the extent of milfoil and other aquatic invasive plant populations in the river corridor.

2. Study costs and impacts of milfoil – economic and other.

3. Use results to drive public education and management decisions.

Potential Partners: DES, UNH, CRWC, Conservation Commissions, Weed Watchers

Location of Action: Cocheco main stem.

Costs and Funding (budget and potential funding source):

$20,000 for study

Expected Benefits:

Study will provide basis for obtaining resources for control of invasives.

Timetable:

Near to mid term

Contingencies: Development of partnerships

Type of Action (choose one or more):

☐ Regulatory X Research ☐ Infrastructure Change ☐ Voluntary

Action Plan HI-9

Title of Action: *Educate the public about the causes and control of nuisance species*

Associated Goal: Habitat Improvement Goal

Associated Objective: Determine the distribution of nuisance aquatic and terrestrial species and habitat to evaluate the present condition of Cocheco River habitat.

Steps Needed to Complete the Action:

1. Choose species or category of species and assemble available information.
2. Develop specific information packets.
3. Design and present public programming.
4. Develop demonstration sites for control of nuisance species.
5. Coordinate programming with DES Weed Watcher Program and with other communities and watershed organizations.

Potential Partners: NH Invasive Species Committee, Rochester, Dover, riparian landowners, NHDES, UNHCE, CRWC, Conservation Commissions, other watershed organizations.

Location of Action: All subwatersheds

Costs and Funding (budget and potential funding source):

$20,000 – grant funding and voluntary participation

Expected Benefits:

Reduced populations and prevention of spreading of invasive aquatic plants.

Timetable: Mid to long term

Contingencies: Landowner cooperation

Type of Action (choose one or more):

☐ Regulatory X Research ☐ Infrastructure Change X Voluntary

Action Plan HI-10

Title of Action*: Conduct a solid waste survey along the Cocheco River corridor and tributaries with the assistance of neighbors and volunteers.*

Associated Goal: Habitat Improvement Goal

Associated Objective: Educate the public about the benefits of a healthy riparian buffer through the use of demonstration sites and activities on the Cocheco River.

Steps Needed to Complete the Action:

1. Organize several volunteer activities to locate deposits of solid waste along river.
2. Identify types and amount of waste at each location.
3. Identify partners to help clean up, remove and dispose of waste.
4. Plan schedule of cleanup and educational activities related to solid waste and riparian corridors.

Potential Partners: CRWC, schools, Waste Management Inc., civic organizations, riparian landowners, volunteers.

Location of Action (particular subwatershed or site):
All subwatersheds.

Costs and Funding (budget and potential funding source):
Grants, business sponsorship, community public works departments

Expected Benefits:
Cleaner river, improved buffer areas, pride in river.

Timetable: Near to long term

Contingencies:

Type of Action (choose one or more):
☐ Regulatory ☐ Research ☐ Infrastructure Change X Voluntary

Action Plan HI-11

Title of Action: *Survey road crossings to identify obstacles to stream flow and wildlife passage*

Associated Goal: Habitat Improvement Goal

Associated Objective:

○ Conduct research on and inventories of aquatic and terrestrial species and their habitat to evaluate the present condition of Cocheco River habitat.
○ Identify sites along tributary streams and the river needing restoration.

Steps Needed to Complete the Action:

1. Identify road crossings of the main stem and tributaries to the Cocheco River.
2. Train volunteers to characterize road crossings and document current conditions.
3. Determine which crossings have obstacles to flow or wildlife passage.
4. Report findings to municipalities, NHDOT, or landowners to correct these crossings.
5. Make recommendations for restoration of critical crossing points and seek cooperation or funding to correct them.

Potential Partners: CRWC, landowners, NHFG, UNHCE, ASNH, municipalities, New Hampshire Department of Agriculture

Location of Action: All subwatersheds

Costs and Funding (budget and potential funding source):
To be determined

Expected Benefits:
Improved understanding of wildlife and instream habitat and land use changes

Timetable: Near term

Contingencies:

Type of Action (choose one or more):
☐ Regulatory **x** Research ☐ Infrastructure Change X Voluntary

Action Plan HI-12

Title of Action: *Understand the impact of dam operations on Cocheco River instream and riparian habitat.*

Associated Goal: Habitat Improvement Goal

Associated Objective:

- **Identify sites along the tributary streams and river needing restoration, and**
- Improve recreational value of river by increasing healthy fish populations.

Steps Needed to Complete the Action:

1. Survey road crossings for restrictions of stream flow. Tour hydropower operations. Locate breeched dams in the Cocheco watershed.

2. Seek information from wildlife and fish biologists, dam operators and dam regulators about dam operations, benefits of operations and impacts on river ecosystems.

3. Educate the public on issues related to benefits and impacts of dam operation.

Potential Partners: Municipalities, NHFG, CRWC, DES River Restoration Program, and NHCP

Location of Action: All subwatersheds

Costs and Funding (budget and potential funding source):
Taxes, grants and in-kind services. Cost to be determined

Expected Benefits:
Better informed decision-making.

Timetable: Near to long term

Contingencies:

Type of Action (choose one or more):

☐ Regulatory ☐ Research x Infrastructure Change ☐ Voluntary

Action Plan HI-13

Title of Action: *Using collected riparian buffer data determine priority buffer restoration areas***.**

Associated Goal: Habitat Improvement Goal

Associated Objectives:

- Conduct research on and conduct inventories of aquatic and terrestrial species and their habitat to evaluate the present condition of the Cocheco River corridor, and
- Restore and protect instream and riparian habitats and buffer areas.

Steps Needed to Complete the Action:

1. Review existing information on instream and riparian habitat condition.
2. Plan additional field studies to fill data gaps.
3. Assess current buffer and instream habitat.
4. Get recommendations for buffer enhancement and species management from NHFG
5. Develop plan to use as basis for restoration of corridor
6. Identify partners to assist or carry out habitat restoration

Potential Partners: CRWC, NHFG, NHDES, TU, municipalities, riparian landowners.

Location of Action: all subwatersheds

Costs and Funding (budget and potential funding source):

To be determined

Expected Benefits:

Improved wildlife and instream habitat

Timetable: Near to long term

Contingencies:

Type of Action (choose one or more):

☐ Regulatory **x** Research ☐ Infrastructure Change **X** Voluntary

Action Plan HI-14

Title of Action: *Restore gravel pits to protect river corridor and to keep new gravel pit habitat intact for buffer integrity.*

Associated Goal: Habitat Improvement Goal

Associated Objective: Restore and protect instream and riparian habitats and buffer areas.

Steps Needed to Complete the Action:

1. Assess riparian habitat in vicinity of gravel pits.
2. Assess wildlife in gravel pit area and along adjacent river corridor
3. Plan and recommend actions

Potential Partners: Gravel pit owners and operators, ASNH, NHFG, communities, DES, UNH, CRWC

Location of Action: Main stem in Farmington, Rochester and Dover

Costs and Funding (budget and potential funding source):

To be determined

Expected Benefits:

Higher quality habitat along River

Timetable: Near to long term

Contingencies: Development of partnerships

Type of Action (choose one or more):

☐ Regulatory X Research x Infrastructure Change x Voluntary

Action Plan HI-15

Title of Action: *Establish additional osprey platforms along the river corridor*

Associated Goal: Habitat Improvement Goal

Associated Objective: Restore and protect instream and riparian habitats and buffer areas.

Steps Needed to Complete the Action:

1. Identify locations for osprey platforms with the assistance of ASNH and NHFG.
2. Work with partners to secure plans and resources.
3. Seek permission from landowners.
4. Build and erect platforms.
5. Monitor usage of platforms by ospreys.
6. Publicize progress of program.

Potential Partners: Landowners, CRWC, NHFG, PSNH, Audubon, UNHCE, Thompson School students.

Location of Action: Middle Cocheco subwatershed.

Costs and Funding (budget and potential funding source):

To be determined, volunteer time and donated materials.

Expected Benefits:

Increase osprey populations and improved river ecosystem.

Timetable:

Near term

Contingencies: Permission for installation and monitoring of platforms

Type of Action (choose one or more):

☐ Regulatory ☐ Research ☐ Infrastructure Change x Voluntary

Action Plan HI-16

Title of Action*: Organize and carry out periodic solid waste cleanups along the Cocheco River corridor and tributaries with the assistance of neighbors and volunteers.*

Associated Goal: Habitat Improvement Goal

Associated Objective:

- Restore and improve instream and riparian habitats and buffer areas.
- Educate the public about the benefits of a healthy riparian buffer through the use of demonstration sites and activities on the Cocheco River.(DSI-6)

Steps Needed to Complete the Action:

1. Solicit volunteers, schools and civic organizations for cleanups.
2. Schedule cleanup days based on volunteer availability.
3. Complete cleanups.
4. Track amount and type of waste removed.
5. Report and publicize progress of cleanups to local media and communities.

Potential Partners: CRWC, schools, Waste Management, Inc., civic organizations, riparian landowners, volunteers.

Location of Action (particular subwatershed or site):
All subwatersheds.

Costs and Funding (budget and potential funding source):
Grants, business sponsorship, community public works departments

Expected Benefits:
Cleaner River, improved buffer areas, pride in river.

Timetable: **Near to long term**

Contingencies: Volunteer resources.

Type of Action (choose one or more):
☐ Regulatory ☐ Research ☐ Infrastructure Change X Voluntary

Action Plan HI-17

Title of Action: *Determine if Cocheco River is a 4th order stream at Mad River Confluence in order to increase the protection of the River through the NH Shoreland Protection Act*

Associated Goal: Habitat Improvement Goal

Associated Objective:

○ Conduct research on and conduct inventories of aquatic and terrestrial species and their habitat to evaluate the present condition of the Cocheco River corridor.
○ Restore and protect instream and riparian habitat s and buffer areas.

Steps Needed to Complete the Action:

1. Understand requirements for 4th order designation.
2. Study tributaries in upper watershed to determine if they meet criteria
3. Follow process for change, if found to be a 4th order stream at the Mad River.

Potential Partners: DES, UNH, CRWC, municipalities

Location of Action: Upper Cocheco

Costs and Funding (budget and potential funding source):

To be determined

Expected Benefits:

Enhance shoreland protection downstream of 4th order confluence based on New Hampshire Shoreland Protection Regulations

Timetable: Near term

Contingencies:

Type of Action (choose one or more):

X Regulatory X Research ☐ Infrastructure Change ☐ Voluntary

Action Plan HI-18

Title of Action: *Determine optimal width of protection corridor on Cocheco River and tributaries to adequately protect wildlife and habitat.*

Associated Goal: Habitat Improvement Goal

Associated Objective: Identify sites along tributary streams and the River needing restoration.

Steps Needed to Complete the Action:

1. Gather and review prior studies and management plans regarding riparian corridors.
2. Learn what areas are now protected along the Cocheco.
3. Perform stream assessments with riparian lands included.
4. Set goals for corridor protection.
5. Work with communities to incorporate corridor protection into regulations and plans.

Potential Partners: CRWC, All municipalities, NHCP, DES, riparian landowners, UNHCE

Location of Action: All subwatersheds

Costs and Funding (budget and potential funding source):

Volunteers and grant funding

Expected Benefits:

Improved riparian corridor habitat, healthy wildlife populations.

Timetable:

Near to mid term

Contingencies: Landowner cooperation

Type of Action (choose one or more):

X Regulatory X Research ☐ Infrastructure Change X Voluntary

Action Plan HI-19

Title of Action: *Work to restore other areas identified for buffer and habitat restoration.*

Associated Goal: Habitat Improvement Goal

Associated Objective: Restore and protect instream and riparian habitats and buffer areas.

Steps Needed to Complete the Action:

1. Report recommended buffer restoration areas to municipalities and landowners, as appropriate.
2. Design restoration projects.
3. Educate public about projects and solicit their participation.
4. Implement projects by phases.
5. Celebrate success of projects.

Potential Partners: Municipalities**,** CRWC, UNHCE, NRCS, landowners

Location of Action: All subwatersheds

Costs and Funding (budget and potential funding source):

Municipal budgets, grants, volunteers

Expected Benefits:

Reduced stream bank erosion, improved habitat, improved aesthetics.

Timetable:

Near to long term

Contingencies: municipal and citizen participation

Type of Action (choose one or more):

☐ Regulatory ☐ Research X Infrastructure Change X Voluntary

Action Plan HI-20

Title of Action: *Work with local land protection organizations to identify and protect priority lands for habitat and river corridor protection.*

Associated Goal: Habitat Improvement Goal

Associated Objectives:

- Conduct research on and conduct inventories of aquatic and terrestrial species and their habitat to evaluate the present condition of the Cocheco River corridor, and
- Restore and protect instream and riparian habitats and buffer areas.

Steps Needed to Complete the Action:

1. Learn what inventory work and land protection measures have been initiated by other groups.
2. Understand priorities for other protection organizations.
3. Work with these organizations to include CRWC priorities in protection efforts.
4. Develop plan to use as basis for restoration of corridor

Potential Partners: CRWC, SRPC, Strafford Rivers Conservancy, NHFG, other conservation groups, open space committees.

Location of Action: all subwatersheds

Costs and Funding (budget and potential funding source):

To be determined

Expected Benefits:

Improved corridor and habitat protection, improved water quality protection.

Timetable: Near to long term

Contingencies:

Type of Action (choose one or more):

☐ Regulatory **x** Research ☐ Infrastructure Change **X** Voluntary

Action Plan HI-21

Title of Action: *Research historic fish species and their distribution within the Cocheco River Watershed.*

Associated Goal: Habitat Improvement Goal

Associated Objective: Improve recreational value of the river by increasing healthy fish populations.

Steps Needed to Complete the Action:

1. Gather prior studies and learn what and where study has been done.
2. Consult with wildlife and fish biologists and managers to learn about present populations.
3. Relate that information to present conditions of river and explore options for restoration.

Potential Partners: CRWC, fishing organizations, UNHCE, NHFG.

Location of Action: All subwatersheds

Costs and Funding (budget and potential funding source):

Volunteers, grant funding.

Expected Benefits:

Better management of fish populations and set goals for restoration of species.

Timetable:

Near term to long term

Contingencies: Available information

Type of Action (choose one or more):

☐ Regulatory X Research ☐ Infrastructure Change ☐ Voluntary

Action Plan HI-22

Title of Action: *Study impact of shallow bedrock on riparian habitat at Whittier Falls in Dover.*

Associated Goal: Habitat Improvement Goal

Associated Objectives:

- Restore and protect instream and riparian habitats and buffer areas.
- Improve recreational value of the river by increasing healthy fish populations.

Steps Needed to Complete the Action:

1. Assess fish habitat at known trouble spots such as impediments to travel and hydromodification.
2. Consider alternatives actions for habitat restoration and choose restoration actions appropriate to the site and fish populations desired.
3. Secure permits and resources to effect restoration.
4. Implement restoration plan.
5. Monitor progress and report.
6. Celebrate successes.

Potential Partners: Town Conservation Commissions, CRWC, NH Fish and Game, Trout Unlimited, New Hampshire Department of Environmental Services.

Location of Action: Whittier Falls in Dover

Costs and Funding (budget and potential funding source):

Dover $750,000

Expected Benefits:

Healthy fish populations and related ecosystem improvement.

Timetable: Near to mid term

Contingencies: **Extensive process**

Type of Action (choose one or more):

☐ Regulatory ☐ Research x Infrastructure Change x Voluntary

Action Plan HI-23

Title of Action: *Work with NH Fish and Game Department and US Army Corps of Engineers to study and improve fish habitat in flood control project on the Cocheco River in Farmington*

Associated Goal: Habitat Improvement Goal

Associated Objective:

- Restore and protect instream and riparian habitats and buffer areas.
- Improve recreational value of the river by increasing healthy fish populations.

Steps Needed to Complete the Action:

1. Set restoration goals for area in concert with Army Corps and Farmington Conservation Commission.
2. Conduct feasibility study of restoration/
3. Develop implementation plan.
4. Implement plan.
5. Monitor progress and report.
6. Celebrate successes.

Potential Partners: Farmington Conservation Commission, CRWC, NH Fish and Game, fishing organizations, US Army CoE

Location of Action: Main stem in Farmington.

Costs and Funding (budget and potential funding source):

Grants. $60,000 for feasibility, $1,000,000 for restoration

Expected Benefits:

Connect fish habitat of Cocheco with Mad River

Timetable: Near to long term

Contingencies: Development of partnerships

Type of Action (choose one or more):

☐ Regulatory ☐ Research x Infrastructure Change x Voluntary

Action Plan HI-24

Title of Action: *Work with the City of Dover on the Berry Brook restoration project and restore brook to natural stream functions.*

Associated Goal: Habitat Improvement Goal

Associated Objective:

- Restore and protect instream and riparian habitats and buffer areas.
- Improve recreational value of the river by increasing healthy fish populations
- Reduce stormwater runoff volume and improve treatment at existing and future stormwater structures. (DSI-4)
- Educate the public about the benefits of a healthy riparian buffer through the use of demonstration sites and activities on the Cocheco River. (DSI-6)

Steps Needed to Complete the Action:

1. Identify water quality and habitat restoration needs. Design restoration project.
2. Plan community outreach to coincide with restoration activities.
3. Educate public about project and solicit their participation.
4. Work with Dover Environmental Projects Coordinator to prepare RFP for contractors, assessment and project design.
5. Implement project by phases.
6. Carry out educational activities as part of project.
7. Implement BMPs with the participation of neighbors and landowners.
8. Celebrate success of project.

Potential Partners: City of Dover**,** CRWC, UNHCE, landowners, UNH Stormwater Center

Location of Action: Lower Cocheco

Costs and Funding (budget and potential funding source):

$150,000 per year for several years, municipal budget, grants, volunteers.

Expected Benefits:

Stormwater storage, pollution prevention, improved habitat, improved aesthetics.

Timetable: Near to long term

Type of Action (choose one or more):

☐ Regulatory ☐ Research X Infrastructure Change X Voluntary

Action Plan HI-25

Title of Action: *Restore Willow (Wordley) Brook and Cocheco River to natural stream function.*

Associated Goal: Habitat Improvement Goal

Associated Objective:

- Restore and protect instream and riparian habitats and buffer areas
- Reduce stormwater runoff volume and improve treatment at existing and future stormwater structures.(DSI-4)
- Educate the public about the benefits of a healthy riparian buffer through the use of demonstration sites and activities on the Cocheco River.(DSI-6)

Steps Needed to Complete the Action:

1. Develop a watershed management plan for Wordley Brook
2. Design water quality and habitat restoration project.
3. Educate public about project and solicit their participation.
4. Begin with cleanup of debris to start project.
5. Implement project by phases.
6. Establish and use BMPs for landowners.
7. Celebrate success of project.

Potential Partners: Rochester DPW and Conservation Commission**,** CRWC, UNHCE, landowners

Location of Action: Middle Cocheco

Costs and Funding (budget and potential funding source):

$150,000 per year for several years, taxes, grants. NRCS WHIP grant, volunteers.

Expected Benefits:

Stormwater storage, pollution prevention, improved habitat, improved aesthetics.

Timetable:

Near to long term

Contingencies: municipal and citizen participation

Type of Action (choose one or more):

☐ Regulatory ☐ Research X Infrastructure Change X Voluntary

Action Plan HI-26

Title of Action: *Work with the Town of Farmington to restore Mad River at Tappan Street.*

Associated Goal: Habitat Improvement Goal

Associated Objective:

- Reduce stormwater runoff volume and improve treatment at existing and future stormwater structures.
- Restore and protect instream and riparian habitats and buffer areas.
- Educate the public about the benefits of a healthy riparian buffer through the use of demonstration sites and activities on the Cocheco River.

Steps Needed to Complete the Action:

1. Design buffer and habitat restoration project.
2. Correct stormwater drainage problems.
3. Educate public about project and solicit their participation.
4. Implement project.
5. Celebrate success of project.

Potential Partners: Town of Farmington**,** CRWC, UNHCE, St. Peters church, NRCS, landowners, DES

Location of Action: Upper Cocheco

Costs and Funding (budget and potential funding source):

Grant and volunteers

Expected Benefits:

Reduced stream bank erosion, improved habitat, improved aesthetics.

Timetable: ***Near term***

Contingencies: municipal and citizen participation

Type of Action (choose one or more):

☐ Regulatory ☐ Research X Infrastructure Change X Voluntary

Development and Stormwater Impact Action Plans

Action Plan DSI-1

Title of Action: *Reduce or minimize proliferation of impervious surfaces in the watershed.*

Associated Goal: Development and Stormwater Impact Goal

Associated Objective:

○ Improve planning, design, and construction methods to reduce negative impact on Cocheco River.

○ Educate the public about the benefits of a healthy riparian buffer through the use of demonstration sites and activities on the Cocheco River.

Steps Needed to Complete the Action:

1. Educate coalition members and public regarding the impact of impervious surfaces on the watershed using recent data and studies (eg. USGS, 2005).
2. Assemble information on alternative to impervious surfaces and innovative stormwater treatment methods.
3. Work with public works department and land use boards to educate them about alternatives to impervious cover and restricting impervious surfaces within generous stream buffers. Request that impervious surface alternatives and effective stormwater treatment methods be adopted for municipal work.
4. Encourage citizens and developers to learn about and utilize impervious surface alternatives and effective stormwater treatment methods.

Potential Partners: Municipalities, NHCP, NHEP, DES, SRPC, UNH Stormwater Center, CRWC, municipal public works departments

Location of Action (particular subwatershed or site): All subwatersheds

Costs and Funding (budget and potential funding source):

To be determined

Expected Benefits:

Water quality improvement, habitat improvement, and aesthetic improvement, reduce mosquitoes.

Timetable: **Near to long term**

Contingencies: None

Type of Action (choose one or more):

☐ Regulatory ☐ Research **X** Infrastructure Change **X** Voluntary

Action Plan DSI-2

Title of Action: *Promote minimum impact developments.*

Associated Goal: Development and Stormwater Impact Goal

Associated Objective:

- Improve planning, design, and construction methods to reduce negative impact on Cocheco River.
- Reduce stormwater runoff volume and improve treatment at existing and future stormwater structures.
- Improve enforcement of federal, state and local regulations that improve and protect the quality of the Cocheco River.

Steps Needed to Complete the Action:

1. Educate coalition members and public regarding minimum impact development.
2. Research standards and practices of minimum impact development.
3. Develop educational materials and displays with examples related to the Cocheco watershed.
4. Promote use of these practices to land use boards and developers through existing and new workshops and land use board technical sessions.

Potential Partners: Municipalities, NHCP, NHDES, SRPC, Jordan Institute and CRWC

Location of Action (particular subwatershed or site): All subwatersheds

Costs and Funding (budget and potential funding source):
To be determined

Expected Benefits:
Improved water quality, stormwater retention and treatment.

Timetable: Near to long term

Contingencies: None

Type of Action (choose one or more):

☐ Regulatory ☐ Research **X** Infrastructure Change **X** Voluntary

Action Plan DSI-3

Title of Action: *Erect a demonstration snow dump to reduce impact of snow waste runoff to the Cocheco River*.

Associated Goal: Development and Stormwater Impact Goal

Associated Objective:

○ Improve planning, design, and construction methods to reduce negative impact on Cocheco River.

○ Reduce stormwater runoff volume and improve treatment of at existing and future stormwater structures.

Steps Needed to Complete the Action:

1. Find interested municipalities and identify a site for the snow dump.
2. Work with DES, other states, and federal agencies to design innovative stormwater treatment for the snow dump.
3. Build the snow dump (municipality would manage all construction related activities).
4. Monitor runoff from new snow dump and compare to impacts from unimproved dumpsites.
5. Hold demonstrations for other municipalities to encourage retrofits or changes to their snow dump areas.

Potential Partners: Municipalities, NHCP, DES, CRWC, municipal public works departments

Location of Action (particular subwatershed or site): Urban areas in Middle and Lower Cocheco.

Costs and Funding (budget and potential funding source):

Municipal tax revenues and grant funding

Expected Benefits:

Water quality improvement, reduction of sedimentation.

Timetable: Near to mid term

Contingencies: None

Type of Action (choose one or more):

☐ Regulatory ☐ Research **X** Infrastructure Change ☐ Voluntary

Action Plan DSI-4

Title of Action: *Assist municipalities in carrying out stormwater management plans.*

Associated Goal: Development and Stormwater Impact Goal

Associated Objective:

- Improve planning, design, and construction methods to reduce negative impact on Cocheco River.
- Improve enforcement of federal, state, and local regulations that improve or protect the quality of the Cocheco River.
- Determine the impact of road crossing design and maintenance on the water quality of the river and tributary streams.

Steps Needed to Complete the Action:

1. Determine regulatory standards for and status of stormwater management planning in each community.
2. Meet with each town to determine how CRWC could assist with plan development and implementation as appropriate in each community.
3. Prepare memorandum of understanding to cooperate in stormwater management activities that benefit from the involvement of CRWC.
4. Perform assistance work using the actions outlined in the agreement.
5. Evaluate program periodically, modify if needed, and report on progress.

Potential Partners: Municipalities, NHCP, DES, CRWC, SRPC, municipal public works departments

Location of Action (particular subwatershed or site): All subwatersheds.

Costs and Funding (budget and potential funding source):

Municipal tax revenues and grant funding

Expected Benefits:

Water quality improvement, reduction of sedimentation.

Timetable: **Near to long term**

Contingencies: None

Type of Action (choose one or more):

X Regulatory ☐ Research **X** Infrastructure Change X Voluntary

Action Plan DSI-5

Title of Action: *Develop Cocheco River Watershed Best Management Handbook for Stormwater Management for residents, municipal staff and officials.*

Associated Goal: Development and Stormwater Impact Goal

Associated Objective:

- Improve planning, design, and construction methods to reduce negative impact on Cocheco River.
- Reduce stormwater runoff volume and improve treatment at existing and future stormwater structures.
- Educate the public about the benefits of a healthy riparian buffer through the use of demonstration sites and activities on the Cocheco River.

Steps Needed to Complete the Action:

1. Collect and review stormwater BMP handbooks completed in other watersheds.
2. Identify unique needs of Cocheco.
3. Assemble working/review group to assist with the project.
4. Seek funding for plan development.
5. Prepare plan with the assistance of the working group.

Potential Partners: Conservation Commissions, NHCP, DES, CRWC, UNH Stormwater Center, municipal public works departments

Location of Action (particular subwatershed or site): All subwatersheds.

Costs and Funding (budget and potential funding source):

Municipal tax revenues and grant funding

Expected Benefits:

Education of citizens about impacts of actions on water quality and habitat. Water quality improvement, reduction of sedimentation.

Timetable: **Near to long term**

Contingencies: None

Type of Action (choose one or more):

☐ Regulatory ☐ Research **X** Infrastructure Change X Voluntary

Action Plan DSI-6

Title of Action: *Educate public about stormwater Best Management Practices (BMPs)*

Associated Goal: Development and Stormwater Impact Goal

Associated Objective: Reduce stormwater runoff volume and improve treatment at existing and future stormwater structures.

Steps Needed to Complete the Action:

1. Conduct storm drain stenciling at catch basins in the Cocheco River Watershed.
2. Develop display materials on stormwater BMP's for public events.
3. Conduct a demonstration workshop at a residential and commercial site.

Potential Partners: CRWC, DES, municipalities, NHCP, NHEP, UNHCE

Location of Action (particular subwatershed or site): Urbanized areas of Upper, Middle and Lower Cocheco

Costs and Funding (budget and potential funding source): Grants, municipal funding, volunteer match. Approximately $10,000

Expected Benefits:
Public understanding of the impacts of stormwater, where the water goes and ultimate change in behavior.

Timetable: **Near to long term**

Contingencies: Development of a BMP handbook.

Type of Action (choose one or more):
☐ Regulatory ☐ Research ☐ Infrastructure Change X Voluntary

Action Plan DSI-7

Title of Action: *Work with citizens and municipalities to reduce shoreand protection violations and stream bank modification*

Associated Goal: Development and Stormwater Impact Goal

Associated Objective:

○ Improve enforcement of federal, state, and local regulations that improve or protect the quality of the Cocheco River.

○ Educate the public about the benefits of a healthy riparian buffer through the use of demonstration sites and activities on the Cocheco River.

Steps Needed to Complete the Action:

1. Educate coalition members and public regarding the benefits of shoreland protection.
2. Review local and state regulations.
3. Encourage enforcement of these regulations by municipalities through meetings with town employees and land use boards. Work on specific examples of successful shoreland protection and known infringements. .
4. Educate and work with riparian landowners to help them understand regulations and the purpose of these requirements.
5. Encourage and promote shoreland protection where none exists.

Potential Partners: Municipalities, NHCP, DES, and CRWC

Location of Action (particular subwatershed or site): All subwatersheds

Costs and Funding (budget and potential funding source):

Municipal budgets

Expected Benefits:

Improved water quality, habitat and recreation potential.

Timetable: **Near to long term**

Contingencies: None

Type of Action (choose one or more):

X Regulatory ☐ Research ☐ Infrastructure Change **X** Voluntary

Action Plan DSI-8

Title of Action*: Work to make the Cocheco River a state designated river under the NH Rivers Management and Protection Program*

Associated Goal: Development and Stormwater Impact Goal

Associated Objective: Educate the public about the benefits of a healthy riparian buffer through the use of demonstration sites and activities on the Cocheco River.

Steps Needed to Complete the Action:

1. Research procedure for river nomination.
2. Form a committee to set strategies and recruit participants.
3. Prepare nomination materials.
4. Become involved in legislative process and encourage public support and participation.

Possible Partners: CRWC, communities, citizens, volunteers, DES

Location of Action (particular subwatershed or site):
Main stem of Cocheco River

Costs and Funding (budget and potential funding source):
Approximately $10,000

Expected Benefits:
Increase in awareness of River, additional regulation to protect River.

Timetable: Long term

Type of Action (choose one or more):
X Regulatory X Research ☐ Infrastructure Change X Voluntary

Action Plan DSI-9

Title of Action: *Promote protection of groundwater resources in the Cocheco watershed.*

Associated Goal: Development and Stormwater Impact Goal

Associated Objective:

○ Protect groundwater resources that provide public water supply, support wetland communities, and recharge tributaries and the Cocheco River.
○ Educate the public about the benefits of a healthy riparian buffer through the use of demonstration sites and activities on the Cocheco River.

Steps Needed to Complete the Action:

1. Identify municipal and community water supply well locations.

2. Identify important groundwater recharge and discharge zones.

3. Provide land protection organizations with information on vulnerable areas and high value riparian habitat.

4. Work with municipalities and land protection organizations to protect the resources that underlie these lands through encouragement of conservation easement and land purchase.

Potential Partners: Municipalities, DES, CRWC, land conservation organizations, landowners.

Location of Action (particular subwatershed or site): All subwatersheds

Costs and Funding (budget and potential funding source):

Municipal tax revenues and grant funding, cooperation with other organizations.

Expected Benefits:

Water quality improvement, protection of fragile ecosystems. Improved riparian habitats.

Timetable: Ongoing. Near to long term

Contingencies: None

Type of Action (choose one or more):

☐ Regulatory ☐ Research **X** Infrastructure Change X Voluntary

Action Plan DSI-10

Title of Action: *Identify and correct flawed or outdated stormwater infrastructure along the Cocheco River and its tributaries.*

Associated Goal: Development and Stormwater Impact Goal

Associated Objective:

○ Improve planning, design, and construction methods to reduce negative impacts on Cocheco River.
○ Reduce stormwater runoff volume and improve treatment of at existing and future stormwater structures.
○ Educate the public about the benefits of a healthy riparian buffer through demonstration sites and activities along the Cocheco River.

Steps Needed to Complete the Action:

1. Work with municipalities to survey stormwater infrastructure conditions.
2. On a case-by-case basis, find ways to correct problems identified.

Potential Partners: Municipalities, NHDOT, DES, CRWC, municipal public works departments

Location of Action (particular subwatershed or site): Urban areas in Middle and Lower Cocheco.

Costs and Funding (budget and potential funding source):

Municipal tax revenues and grant funding

Expected Benefits:

Water quality improvement, reduction of sedimentation, and improved riparian habitats.

Timetable: **Near to mid term**

Contingencies: None

Type of Action (choose one or more):

☐ Regulatory ☐ Research **X** Infrastructure Change ☐ Voluntary

Action Plan DSI-11

Title of Action: *Encourage and sponsor innovative stormwater treatment demonstration projects*.

Associated Goal: Development and Stormwater Impact Goal

Associated Objective:

- Improve planning, design, and construction methods to reduce negative impact on Cocheco River.
- Reduce stormwater runoff volume and improve treatment of at existing and future stormwater structures.
- Educate the public about the benefits of a healthy riparian buffer through demonstration sites and activities along the Cocheco River.

Steps Needed to Complete the Action:

1. Identify potential locations for innovative stormwater treatment systems.
2. Work with municipal staff to identify and develop an appropriate innovative treatment method.
3. Design site specific application.
4. Implement design on chosen site.
5. Demonstrate the innovate system for other municipal staff and/or land use boards.

Potential Partners: Municipalities, DES, CRWC, public works departments

Location of Action (particular subwatershed or site): Middle and Lower Cocheco subwatersheds

Costs and Funding (budget and potential funding source):

Municipal tax revenues and grant funding

Expected Benefits:

Water quality improvement, reduction of sedimentation. Improved riparian habitats.

Timetable: **Near to long term**

Contingencies: None

Type of Action (choose one or more):

☐ Regulatory ☐ Research **X** Infrastructure Change ☐ Voluntary

Action Plan DSI-12

Title of Action: *Evaluate road crossings and lessen stormwater impairment at these Cocheco River discharge points.*

Associated Goal: Development and Stormwater Impact Goal

Associated Objective:

○ Improve planning, design, and construction methods to reduce negative impact on Cocheco River

○ Reduce stormwater runoff volume and improve treatment of at existing and future stormwater structures.

○ Educate the public about the benefits of a healthy riparian buffer through demonstration sites and activities along the Cocheco River.

Steps Needed to Complete the Action:

1. Review best management practices for road crossings.
2. Develop liaisons with public works departments.
3. Assess Cocheco River and tributary road crossings and maintenance practices with respect to erosion and sedimentation.
4. Work with municipalities to promote correction of runoff problems
5. Promote improved maintenance practices.

Potential Partners: Municipalities, DES, CRWC, municipal public works departments

Location of Action (particular subwatershed or site): All subwatersheds

Costs and Funding (budget and potential funding source):

Municipal tax revenues and grant funding

Expected Benefits:

Water quality improvement, reduction of sedimentation, and improved riparian habitats.

Timetable: **Near to mid term**

Contingencies: None

Type of Action (choose one or more):

☐ Regulatory ☐ Research **X** Infrastructure Change ☐ Voluntary

Action Plan DSI-13

Title of Action: *Educate department of public works managers and road crews on impacts of road treatment and construction on river and tributaries in watershed.*

Associated Goal: Development and Stormwater Impact Goal

Associated Objective:

○ Improve planning, design, and construction methods to reduce negative impact on Cocheco River,

○ Educate the public about the benefits of a healthy riparian buffer through demonstration sites and activities along the Cocheco River.

Steps Needed to Complete the Action:

1. Work with DES, NHCP and NHDOT to develop a "road show" about treatment and stormwater impacts on rivers and streams.
2. Work with "Roads scholars" to develop a program for DPW's.
3. Use show for municipal training programs.
4. Develop demonstration sites for Best Management Practices for road treatment and construction adjacent to crossings.

Potential Partners: Municipalities, DES, CRWC, NHCP, municipal public works departments, UNH T2, and NHDOT

Location of Action (particular subwatershed or site): All subwatersheds

Costs and Funding (budget and potential funding source):

Municipal tax revenues and grant funding

Expected Benefits:

Water quality improvement, reduction of sedimentation, and improved riparian habitats.

Timetable: **Near to mid term**

Contingencies: None

Type of Action (choose one or more):

☐ Regulatory ☐ Research **X** Infrastructure Change ☐ Voluntary

Action Plan DSI-14

Title of Action*: Establish a riparian buffer demonstration site(s).*

Associated Goal: Development and Stormwater Impact Goal

Associated Objective: Educate the public about the benefits of a healthy riparian buffer through the use of demonstration sites and activities on the Cocheco River.

Steps Needed to Complete the Action:

1. Identify buffer/restoration sites that would be suitable for educational purposes.
2. Work with technical and education experts to develop educational programming.
3. Seek funding and support for project.
4. Modify/improve existing buffer as necessary.
5. Prepare and install signage at training site.
6. Develop educational and training programs using the chosen site as a major teaching tool.
7. Evaluate success and modify buffer site as needed.

Potential Partners: CRWC, communities, UNHCE, riparian landowners, volunteers.

Location of Action (particular subwatershed or site):
Subwatershed of chosen site (probably Middle or Lower Cocheco).

Costs and Funding (budget and potential funding source):
To be determined.

Expected Benefits:
Improved understanding of resource management, improved water and habitat quality

Timetable: **Near term**

Contingencies: Appropriate buffer sites available

Type of Action (choose one or more):
☐ Regulatory X Research X Infrastructure Change X Voluntary

Action Plan DSI-15

Title of Action*: Prepare and provide citizen/municipal training programs at riparian demonstration sites.*

Associated Goal: Development and Stormwater Impact Goal

Associated Objective: Educate the public about the benefits of a healthy riparian buffer through the use of demonstration sites and activities on the Cocheco River.

Steps Needed to Complete the Action:

1. Identify buffer and restoration sites that would be suitable for educational purposes.
2. Work with technical and education experts to develop educational programming.
3. Seek funding and support for project.
4. Implement a variety of public education and training programs.
5. Evaluate success and publish report.

Potential Partners: CRWC, communities, riparian landowners, volunteers, DES, UNHCE.

Location of Action (particular subwatershed or site):

All subwatersheds.

Costs and Funding (budget and potential funding source):

Integrate with restoration costs. Costs to be determined.

Expected Benefits:

Improved resource management, improved water and habitat quality

Timetable: Near to long term

Contingencies: Appropriate buffer sites available

Type of Action (choose one or more):

☐ Regulatory ☐ Research X Infrastructure Change X Voluntary

Action Plan DSI-16

Title of Action: *Work with municipalities to develop and implement Best Management Practices along riparian corridors.*

Associated Goal: Development and Stormwater Impact Goals

Associated Objective:

○ Improve planning, design, and construction methods to reduce negative impact on Cocheco River,
○ Educate the public about the benefits of a healthy riparian buffer through demonstration sites and activities along the Cocheco River.

Steps Needed to Complete the Action:

1. Review existing riparian corridor Best Management Practices (BMPs)
2. Prepare materials on BMPs for Cocheco River and its tributaries.
3. Work with municipalities to implement practices.
4. Introduce BMP concepts to the public through the media.

Potential Partners: Municipalities, DES, UNH T2, CRWC, NHCP, and UNHCE

Location of Action (particular subwatershed or site): All subwatersheds

Costs and Funding (budget and potential funding source):

In kind services and grant funding

Expected Benefits:

Water quality improvement, reduction of sedimentation, improved aesthetics, and improved riparian habitats.

Timetable: Mid term

Contingencies: None

Type of Action (choose one or more):

☐ Regulatory ☐ Research ☐ Infrastructure Change X Voluntary

Action Plan DSI-17

Title of Action: *Educate citizens, riparian landowners, and municipalities about the value of riparian buffers and Best Management Practices for streamside use.*

Associated Goal: Development and Stormwater Impact Goal

Associated Objective:
Educate the public about the benefits of a healthy riparian buffer through demonstration sites and activities along the Cocheco River.

Steps Needed to Complete the Action:

1. Work with DES, NHCP to develop a "road show" about the value of riparian buffers.
2. Work with "Roads Scholars" (volunteers) to develop a program for DPW's.
3. Develop interactive educational programs.
4. Offer these training programs at demonstration buffer sites.

Potential Partners: Municipalities, NHDES, CRWC, NHCP, UNH T2 and UNHCE

Location of Action (particular subwatershed or site): All subwatersheds

Costs and Funding (budget and potential funding source):
In kind and grant funding

Expected Benefits:
Water quality improvement, functioning streams, and reduction of sedimentation. Improved riparian habitats.

Timetable: Near to long term

Contingencies: None

Type of Action (choose one or more):

☐ Regulatory ☐ Research **X** Infrastructure Change **X** Voluntary

Action Plan DSI-18

Title of Action: *Correct erosion at Cocheco Road Bridge crossing of Cocheco River in Farmington and restore the canoe landing.*

Associated Goal: Development and Stormwater Impact Goal

Associated Objectives:

- Improve planning, design, and construction methods to reduce negative impacts of development on the Cocheco River.

- Improve public perception through increased access to the river for recreation and enjoyment.

Steps Needed to Complete the Action:

1. Obtain previously prepared erosion control design from NRCS.
2. Meet with Farmington town staff and officials to plan project and acquire funding and other resources.
3. Reconstruct canoe launch and complete erosion control.
4. Celebrate new access to River.

Potential Partners: Town of Farmington, Boy Scouts, CRWC

Location of Action (particular subwatershed or site): Upper Cocheco

Costs and Funding (budget and potential funding source):
Materials and construction will be a combination of Town resources and contributions from the private sector.

Expected Benefits: Improved and safer access to the River, remediation of erosion and sedimentation at access point.

Timetable: Near term

Contingencies: None

Type of Action (choose one or more):

☐ Regulatory ☐ Research X Infrastructure Change X Voluntary

Action Plan DSI-19

Title of Action: *Improve drainage from River Street in Rochester at the City Dam.*

Associated Goal: Development and Stormwater Impact Goal

Associated Objectives:

- Improve planning, design, and construction methods to reduce negative impacts of development on the Cocheco River.
- Reduce stormwater runoff volume and improve treatment at existing and future stormwater structures.

Steps Needed to Complete the Action:

1. Rochester Public Works design project.
2. Construct new drainage structure.
3. Restore the stream bank.
4. Celebrate completion of the project with CRWC.
5. Evaluate and publish the success of the project.

Potential Partners: City of Rochester Public Works Department, CRWC

Location of Action (particular subwatershed or site): Middle Cocheco

Costs and Funding (budget and potential funding source):
Municipal budget allocation.

Expected Benefits: Improved water quality, habitat, aesthetics and access to the river.

Timetable: **Near term**
Contingencies: None

Type of Action (choose one or more):

☐ Regulatory ☐ Research X Infrastructure Change ☐ Voluntary

Action Plan DSI-20

Title of Action: *Correct and improve stormwater drainage at Catherine Street in Rochester.*

Associated Goal: Development and Stormwater Impact Goal

Associated Objectives:

- Improve planning, design, and construction methods to reduce negative impacts of development on the Cocheco River.
- Reduce stormwater runoff volume and improve treatment at existing and future stormwater structures.

Steps Needed to Complete the Action:

1. Design project
2. Construct new drainage system.
3. Revegetate and restore the riparian buffer.
4. Evaluate the success of the project and report on it.

Potential Partners: Rochester Public Works Department, NRCS.

Location of Action (particular subwatershed or site): Middle Cocheco

Costs and Funding (budget and potential funding source):
Funding allocated with NRCS WHIP program.

Expected Benefits: Reduced erosion and sedimentation**,** improved water and habitat quality.

Timetable: Near term

Contingencies: None

Type of Action (choose one or more):

☐ Regulatory ☐ Research X Infrastructure Change ☐ Voluntary

Action Plan DSI-21

Title of Action: *Restore sewer easement crossing of Hurd Brook in Rochester*.

Associated Goal: Development and Stormwater Impact Goal

Associated Objectives:

- Determine the impact of road crossing design and maintenance on the water quality of the river and tributary streams.
- Conduct youth civic engagement activities focused on the river.(PPE)

Steps Needed to Complete the Action:

1. Design project with Rochester Public Works to minimize impact on stream.
2. Work with youth and DPW to replace stones and improve drainage structure.
3. Work with students to assess trout habitat and complete additional restoration as needed.
4. Celebrate completion of the project.
5. Evaluate the success of the project and report on it.

Potential Partners: City of Rochester Public Works Department, CRWC, Local youth group or students, NRCS.

Location of Action (particular subwatershed or site): Middle Cocheco

Costs and Funding (budget and potential funding source):
Funding allocated with NRCS WHIP program.

Expected Benefits: Reduced erosion and sedimentation**,** improved water quality, trout habitat, aesthetics and access to the River.

Timetable: Near term

Contingencies: Permission of riparian landowner

Type of Action (choose one or more):

☐ Regulatory ☐ Research X Infrastructure Change X Voluntary

Action Plan DSI-22

Title of Action: *Establish residual winter de-icing sand removal management from bridges in Farmington at Cocheco Road, old bridge by Route 11 on Mad River, and River Street Bridge on Mad River.*

Associated Goal: Development and Stormwater Impact Goal

Associated Objectives: Reduce stormwater runoff volume and improve treatment at existing and future stormwater structures.

Steps Needed to Complete the Action:

1. Work with Farmington DPW and NHDOT to schedule sand removal as part of road maintenance plan.

2. Dispose of materials properly.

3. Evaluate the success of the project and report on it.

Potential Partners: Farmington DPW, NHDOT

Location of Action (particular subwatershed or site): Upper Cocheco

Costs and Funding (budget and potential funding source):
Addition to road maintenance budget for Farmington DPW if necessary

Expected Benefits: Reduced erosion and sedimentation**,** improved water quality, fish habitat, aesthetics and access to the River.

Timetable: Near term

Contingencies: None

Type of Action (choose one or more):

☐ Regulatory ☐ Research X Infrastructure Change X Voluntary

Action Plan DSI-23

Title of Action: *Remove accumulation of yard waste at the Dewey Street footbridge in Rochester and restore river bank in that location.*

Associated Goal: Development and Stormwater Impact Goal

Associated Objectives:

- Improve enforcement of federal, state and local regulations that improve or protect the quality of the Cocheco River.
- Educate the public about the benefits of a healthy riparian buffer through the use of demonstration sites and activities on the Cocheco River.

Steps Needed to Complete the Action:

1. Recruit volunteers from Riverside Drive neighborhood and plan restoration.
2. Work with Rochester DPW to remove accumulated yard waste.
3. Work with volunteers to re-plant vegetation along buffer area.
4. Educate neighborhood residents about composting or other means of disposing of their yard waste.
5. Evaluate the success of the project and report on it.

Potential Partners: City of Rochester Department of Public Works, CRWC, neighborhood residents.

Location of Action (particular subwatershed or site): Middle Cocheco

Costs and Funding (budget and potential funding source):

Funding allocated with NRCS WHIP program.

Expected Benefits: Reduced erosion and sedimentation**,** improved water quality, trout habitat, aesthetics and buffer for the river.

Timetable: Near term

Contingencies: None

Type of Action (choose one or more):

X Regulatory ☐ Research X Infrastructure Change X Voluntary

Action Plan DSI-24

Title of Action: *Develop and implement a municipal stormwater ordinance and regulations that protect the river and its tributaries from additional pollutant loads and degradation.*

Associated Goal: Development and Stormwater Impact Goal

Associated Objectives:

- Improve planning, design, and construction methods to reduce negative impacts of development on the Cocheco River.
- Reduce stormwater runoff volume and improve treatment at existing and future stormwater structures.

Steps Needed to Complete the Action:

1. Survey existing planning and zoning ordinances and regulations in all watershed municipalities to determine how they could be modified to further protect the watershed.
2. Based on impervious cover measurements, development trends, and MS4 requirements, develop guidelines for level of stormwater protection.
3. Work with SRPC, DES and municipalities to utilize or develop model ordinances and regulations.
4. Through CRWC and RTAC members, work with land use boards to implement these new ordinances and regulations.
5. Evaluate changes in municipal stormwater regulations every two years and suggest modifications as needed.

Potential Partners: Municipal land use boards, SRPC, DES.

Location of Action (particular subwatershed or site): All subwatersheds.

Costs and Funding (budget and potential funding source):
Municipal budgets, grant funding.

Expected Benefits: Reduced impact from new and existing stormwater infrastructure.

Timetable: **Near to long term**.

Contingencies: None

Type of Action (choose one or more):

X Regulatory ☐ Research X Infrastructure Change X Voluntary

Appendix D

Evaluating the Success of the Cocheco River Watershed Restoration Plan

Appendix D - Measuring the Success of the Watershed Restoration and Implementation Plan for the Cocheco River Watershed

Water Quality Restoration				
Goal	**Obj. #**	**Objective**	**Long Term Target**	**Tool or Method of Evaluation**
Improve the water quality of the Cocheco River to meet NH Class B water quality standards by 2015.	1	Determine and minimize causes of anomalous dissolved oxygen, biological oxygen demand, and temperature fluctuations within the Cocheco River.	By 2015 all segments of the river (assessment units) support designated uses under Class B water quality standards.	Water Quality monitoring and DES assessments as per the Consolidated Assessment and Listing Methodology (CALM).
	2	Understand and eliminate impact of failed septic systems and other bacterial loading on the Cocheco River.	By 2015 all segments of the river (assessment units) support designated uses under Class B water quality standards.	Water Quality monitoring and DES assessments as per the Consolidated Assessment and Listing Methodology (CALM).
	3	Determine and work to reduce sources of elevated nutrients (phosphorus and nitrogen) through modification of the sampling program.	By 2015 all segments of the river (assessment units) support designated uses under Class B water quality standards.	Water Quality monitoring and DES assessments as per the Consolidated Assessment and Listing Methodology (CALM).
	4	Understand and reduce negative impact of stormwater discharge on the Cocheco River.	By 2015 all segments of the river (assessment units) support designated uses under Class B water quality standards.	Water Quality monitoring and DES assessments as per the Consolidated Assessment and Listing Methodology (CALM).
	5	Determine sources and impacts of metals contamination in the Cocheco River Watershed and work to minimize impacts.	By 2015 all segments of the river (assessment units) support designated uses under Class B water quality standards.	Water Quality monitoring and DES assessments as per the Consolidated Assessment and Listing Methodology (CALM).
	6	Research impact of current and proposed streamflow withdrawals on Cocheco River water quality.	No net increase in water withdrawls.	Periodic surveys of Cocheco water withdrawals.
	7	Determine impacts of current and former land use on Cocheco River water quality and work to reduce these effects.	By 2015 all segments of the river (assessment units) support designated uses under Class B water quality standards.	Evaluation of water quality data and DES assessment.
Public Perception and Education				
Goal	**Obj. #**	**Objective**	**Long Term Target**	**Tool or Method**
Change the negative public perception of and behavior towards the Cocheco River so that the assets and benefits of the Cocheco River can be realized.	1	Improve public perception through increased access to the River for recreation and enjoyment.	By 2015, 5 new canoe landings completed. Successful institution of an annual River Fest and photo contest.	User surveys, qualitative and quantitative reports, photo documentation.
	2	Establish objective and subjective values for the river.	- Complete economic benefit study by 2008. - Complete State Desginated River Study by 2008. - Complete water supply benefit study by 2008. - Complete stakeholder economic, aesthetic, environmental, community and existence surveys every 3 years beginning in 2007.	Completed research documents and citizen surveys.
	3	Use Rochester and Dover river walks to improve public perception of the river in both urban and rural settings.	Two urban riverwalks completed and used by 2015. Three rural riparian trails built and in use by 2015.	User surveys, qualitative and quantitative reports, photo documentation.
	4	Work closely with regional, state, and national organizations and agencies on shared goals and objectives.	One new collaboration per year.	Partner evaluation focus group every two years.
	5	Encourage public participation in all aspects of river restoration activities.	Annual 25% increase in volunteer participation.	Tracking by coordinator.
	6	Demonstrate that the river is a sum of all the large and small streams that feed into the Cocheco and that attention to all these streams is important.	Effect a 10% annual increase in citizen understanding of watershed concepts.	Survey public in 2006 and again in 2015.
	7	Conduct youth civic engagement activities focused on river restoration.	One new GoMI team and one other new youth or school group each year.	Qualitative case study of youth engagement each year.

Habitat and Wildlife Restoration				
Goal	**Obj. #**	**Objective**	**Long Term Target**	**Tool or Method**
Understand and improve the instream and riparian habitat of the Cocheco River watershed to assure the ecological well being of the River.				
	1	Conduct research on and conduct inventories of aquatic and terrestrial species and their habitat to evaluate the present condition of Cocheco River corridor.	Natural Resource Inventories (NRI's) completed in watershed communities by 2010. Habitat evaluations completed in all subwatersheds by 2015.	Reports and publications of NRI's and habitat evaluations. Tracking by coordinator. Aquatic habitat use tracked by DES Assessments in accordance with CALM.
	2	Determine the distribution of nuisance aquatic and terrestrial species and habitat to evaluate the present condition of Cocheco River habitat.	Surveys of all subwatersheds by 2010.	Reports and publications of surveys.Tracking by coordinator.
	3	Identify sites along tributary streams and the River needing restoration	All stream restoration surveys complete by 2010.	Complete listing of potential restoration sites each year. Tracked by coordinator.
	4	Restore and protect instream and riparian habitat and buffer areas.	Complete restoration projects at one to two sites each year.	Photo documentation and written evaluation of habitat restoration by wildlife resource professional for each project.
	5	Improve recreational value of river by increasing healthy fish populations.	One fish restoration project initiated per year from 2006 to 2015.	Fish population and viability studies and evaluation by wildlife professional.
Development and Stormwater Impact				
Goal	**Obj. #**	**Objective**	**Long Term Target**	**Tool or Method**
Minimize the impact of stormwater and current and future development on the Cocheco River and its tributaries.				
	1	Improve planning design and construction methods to reduce negative impacts on the Cocheco River.	Low impact development practices (LID) required by ordinance in all subwatershed communities and stormwater infrastructure meets standards by 2015. Stormwater BMP training for all communities.	Survey of land use ordinances for LID and stormwater practices in each community. BMP training follow up survey.
	2	Improve enforcement of federal, state, and local regulations that improve or protect the quality of the Cocheco River.	There will be knowledge and enforcement of applicable regulations by responsible officials in all watershed communities by 2010	Periodic surveys of officials between 2006 and 2010.
	3	Protect groundwater resources that provide public water supply and recharge tributaries and the Cocheco River.	Permanent protection of 10% of land in the watershed with a focus on water resources. 2015	Track land protection activities by local and regional land protection organizations. Use GRANIT conservation layer to assist with tracking.
	4	Reduce stormwater runoff volume and improve treatment at existing and future stormwater structures.	Increased use of BMP's, LID, or innovative stormwater technology at 3 or more sites per year. Stormwater pollutant loads in the Middle Cochecho, Lower Isinglass and Lower Cocheco subwatersheds will not exceed 2005 levels.	Water quality monitoring of pre- and post-construction conditions including photo documentation and reports. Land use ordinances in place in Farmington, Rochester, Dover and Somersworth that require stormwater to remain on site for all new developments and re-developments.--Move this to the Target column.
	5	Determine the impact of road crossing design and maintenance on the water quality of the River and tributary streams then work to correct any problems.	Fix three road crossing problems every two years beginning in 2007.	Project tracking.
	6	Educate the public about the benefits of a healthy riparian buffer through the use of demonstration sites and activities on the Cocheco River.	Develop three demonstration sites and hold a workshop at each site by 2015. Increased knowledge of riparian benefits by riparian landowners.	Pre- and post- survey of workshop participants and citizens.